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Molecular Motion the Fundamental Problem of Nature.

It is thought by the advocates of the physical school that, although at present we are unable to explain how organic nature can be built up by the play of the ordinary chemical forces, yet at some future day when we shall have come to know far more of molecular physics than we do at present, then we may be able to explain the mystery. This is the cherished hope of modern evolutionists, and of the advocates of the physical theory of life. But it is, says Mr. Croll, in a late number of the *Philosophical Magazine*, a mental delusion, a dream which will never be realized.

It is from the effects produced that we know that that mode of molecular motion called heat differs from that mode called electricity. The effects do not as yet enable us to determine wherein this difference consists; but it enables us to conclude with certainty that there is a difference.

Effects which are electrical we refer to that unknown mode of motion called electricity. We do not refer them to that mode called heat, because the effects are different from those which we ascribe to heat. Each mode of motion, each energy, is distinguished by the effects which it produces. Determination of the molecules of matter according to the objective idea of a plant or an animal is an effect which is constantly taking place in organic nature. To attribute this effect to electricity, for example, would be far more absurd than to attribute electrical effects to gravitation or to heat; for the difference between this effect and any electrical effect is immeasurably greater than between electrical effect and any effects produced by heat, or by gravitation, or by any other of the forces of inorganic nature. It would be far more rational to attribute all the phenomena of the inorganic world, say, to heat, than to attribute the determination of molecular motion in the organic world to chemical and physical energies.

Nothing which can be determined by the comparative anatomist, no biological researches, no microscopic investigations, no considerations regarding natural selection or the survival of the fittest, can solve the great problem of nature; for it lies in the background of all such investigations. The problem is molecular. From the hugest plant and animal on the globe down to the smallest organic speck visible under the microscope, all have been built up, molecule by molecule. and the problem is to explain this molecular process. If one plant or animal differs from another, or the parent from the child, it is because in the building-u pprocess the determinations of molecular motion were different in the two cases; and the true and fundamental ground of the difference must be sought for in the cause of the determination of molecular motion. Here in this region, the doctrine of natural selection and the struggle for existence can afford no more light on the matter than the fortuitous concourse of atoms and the atomical philosophy of the ancients.

Locating the Great Refracting Telescope.

The United States Coast Survey Bureau is about to locate an elevated astronomical station, somewhere among the Sierra Nevada mountains. The San Francisco *Bulletin* says that Professor Davidson, of the Coast Survey, is experimenting near Summit Station, at an elevation of 7,200 feet above the sea, to determine the relative importance of great and small altitudes in the use of the telescope for investigations of physical astronomy. It is understood that he has been completely successful, and will recommend a location about 10,000 feet above the sea, near the line of the Central Pacific Railroad, from which it can be readily reached by a short and easily constructed wagon road. Professor Young, of Dartmouth College, has been experimenting with larger instruments at Sherman, on the Rocky Mountains, at an elevation of 8,242 feet above the sea.

The results of these observers will be presented in reports that will probably lead to the locating of the twenty-seven inch refracting telescope at one of these elevations. The lenses for this telescope are being ground by the Messrs. Clark, of Cambridgeport, Mass., for the United States Government, at an expense of nearly $50,000. With such a telescope, and the high magnifying power of which it will admit the use, there is not over one or two nights per year on the low Atlantic coast where it could be used with its highest magnifying powers. On the Sierra, with the long freedom from clouds, many more favorable opportunities must exist for observations, and we may look forward for marvelous revelations in physical astronomy.

Progress of Atlantic Steam Navigation.

The *California* is the name of a new steamship, lately arrived at New York, belonging to the Anchor line, plying between New York and Glasgow, Scotland. The *California* was built and finished at Glasgow, Scotland, during the present year, by Alexander Stephens & Sons, and is an iron screw steamer of 3,287·08 gross tuns, is 361·5 feet in length, 40·5 feet in beam, and 24·5 feet depth from tunnage deck to ceiling, and 31·5 feet from upper deck to ceiling. Her beam being so great makes her a very safe and easy vessel at sea. She has two compound vertical direct-acting engines, with one cylinder 103 inches in diameter and one 57 inches in diameter, with 4 feet stroke of piston, working up to 1,047 H. P., and built at the Finnieston Steamship Works. Her steam power is generated in six boilers, tested to a pressure of 70 lbs., and a donkey boiler for supplying steam to the windlass, winch, and other labor-saving engines.

The second of the new fleet, the *Victoria*, a sister ship to the *California*, has just been launched, and the *Bolivia* and *Ethiopia*, of 4,500 tuns each, are well forward. Three other steamers are in frames, viz., the Eutopia, Castilia, and Italia, making in all seven steamers, of over 23,000 tons in the aggregate, and valued at $500,000 each, all to be built within one year.

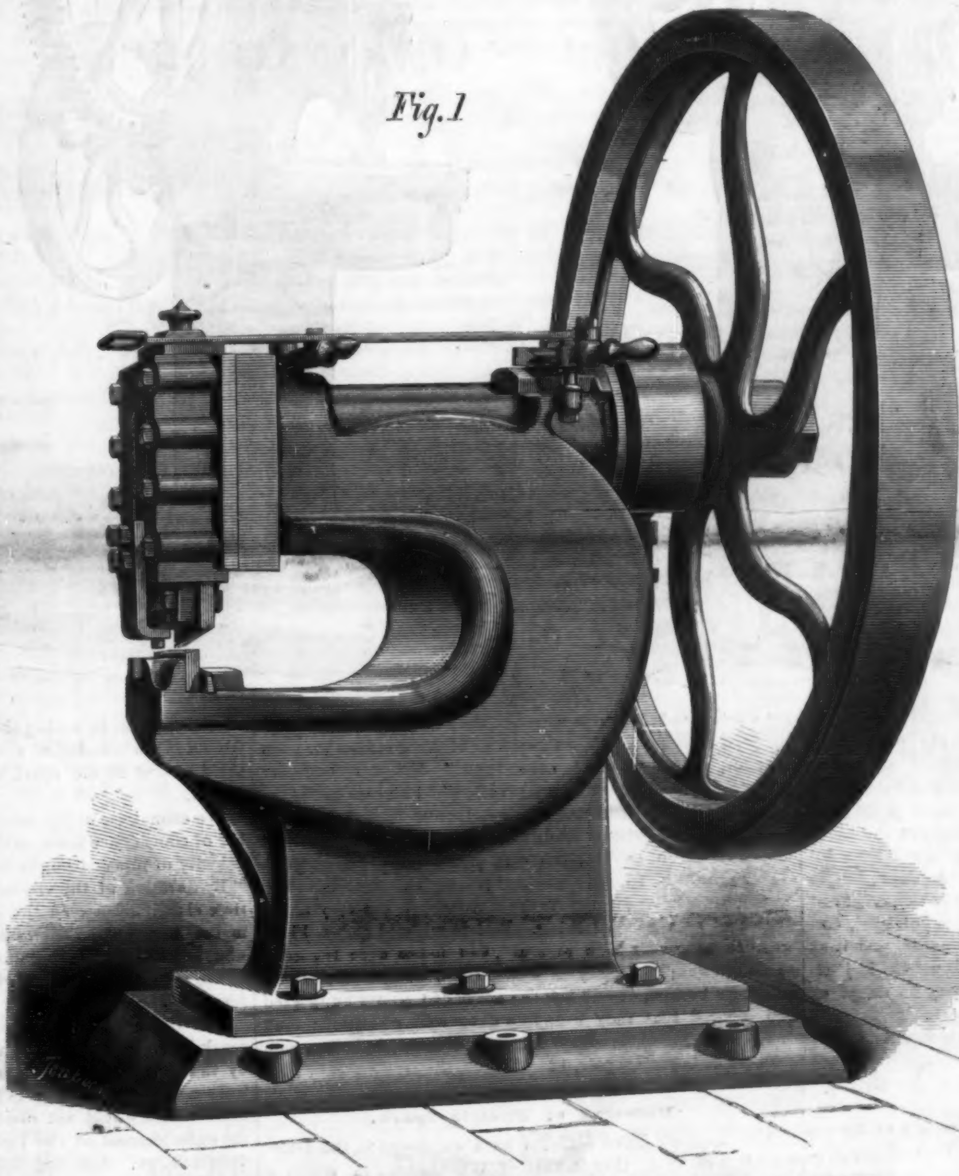
PATENT PUNCHING AND SHEARING MACHINE.

Perhaps in no branch of metal working has there been greater progress than is shown in the manufacture of all descriptions of punched and stamped ware. There are, in fact, but few of the myriad of metal articles found upon the shelves of our hardware and house-furnishing stores which are not, in some stage of their manufacture, subjected to the action of a machine of this class. That high degree of skill which was necessary to produce each article is now made available through these machines, in producing a thousand articles precisely alike, and at a price very low in comparison with former times, when such work was done by hand.

Our illustrations represent three forms of machines made under patents granted to Moses G. Wilder, bearing date June 27, 1871, and May 28, 1867 (reissued June 27, 1871.)

Fig. 1 is known as Wilder's patent combined punching and shearing machine. This apparatus is made to punch holes three fourths of an inch in diameter, in iron one half inch thick, to the center of a forty inch sheet, and will shear half inch iron to the center of a thirty-six inch sheet. It is constructed in two forms, one with a plain fly wheel of large size, as shown in the engraving, for use where a somewhat rapid motion is possible. The other, with a geared driving train, permits a slower motion of the punch and increases the power of the machine, so that, when geared, it will punch three fourths inch holes in three fourths inch iron, and will shear three fourths inch plates or bars. The engraving shows both the punch and shear blades in position, though this is never the case when the machine is in use. The punch and upper shear blade are so arranged that either may be removed instantly or replaced with perfect certainty. The die and lower shear blade remain fixed at all times, except when it is necessary to change the size of the holes to be punched or to sharpen the shears.

Fig. 1



WILDER'S PATENT PUNCHING AND SHEARING MACHINE.

Among the advantages claimed for this machine are that its form is such that it may be set back against a wall or partition, instead of in the center of the shop floor, as is now the case with the ordinary combined punch and shears. Owing to the peculiar manner of combining the punch and shears in one pair of jaws, instead of making the machine double, it can be sold at a low price, while it has every capacity for work. The machine may be run continuously or arrested after each movement, or may be arranged to stop at any point in the revolution. The distribution of metal is such that the machine is rigid and stiff, and does not spring perceptibly in doing its heaviest work.

In Fig. 3 is shown another form of these machines, such as is used for punching sheet metal into the great variety of shapes required by brass and hardware manufacturers, silversmiths, tinners, etc., in cases where rapidity of movement is of more importance than great power. The die is held in any suitable manner upon the bolster plate, A. This, in its

turn, is fastened by bolts to the die bed, B. The punch is held in the lower part of the slide or gate, C, in such manner as that, when the slide descends, it will enter the die, cutting out a piece from any material previously interposed between it and the die, and of the precise form of the latter. Motion is given to the slide, C, by an eccentric or crank wrist on the front end of the shaft, D, through a pitman or connection, E, which is pivoted at its lower end to the slide, C, and which, at its upper end, surrounds the crank, D. The shaft, D, receives motion from the flywheel, F, which runs loosely upon it and is connected to it by the sliding bolt of the stop motion, G, when the treadle, H, is depressed by the foot of the operator. This sliding bolt is so formed that, when the press is at rest, the pressure of the operator's foot forces it into engagement with the wheel positively. As the press starts, this bolt, which is fitted to slide back and forward in an arm or reinforce, I (which is keyed rigidly to the shaft, D, and revolves with the shaft), also revolves with the wheel and shaft. The stop bolt is moved back and forward by means of a sliding cam plate, which is fitted to the frame of the machine at G. This cam plate has a channel way with inclined faces through which the stop bolt passes in each revolution. These inclined faces act upon the bolt to move it in or out, and are governed by the treadle worked by the operator. The cam plate is connected to the treadle by means of an eccentric gear working upon a fixed stud placed in the side of the frame, a toothed sector which acts upon the gear, and a small rod to connect this sector to the treadle, H. Inside of the frame is a counter weight which acts upon the treadle rod, at J, to lift the treadle, H, when the operator's foot is removed. When the treadle is depressed, the press starts and will continue running while the treadle remains down. When the foot is removed, the weight at J operates to move the cam plate back from the arm, I. The stop bolt, as it enters the channel way in the cam plate, is withdrawn, releasing the wheel, F, and the press stops, remaining at rest until the treadle is again depressed. The parts of this stop motion are strong and simple in form and work wholly without springs.

Fig. 2.

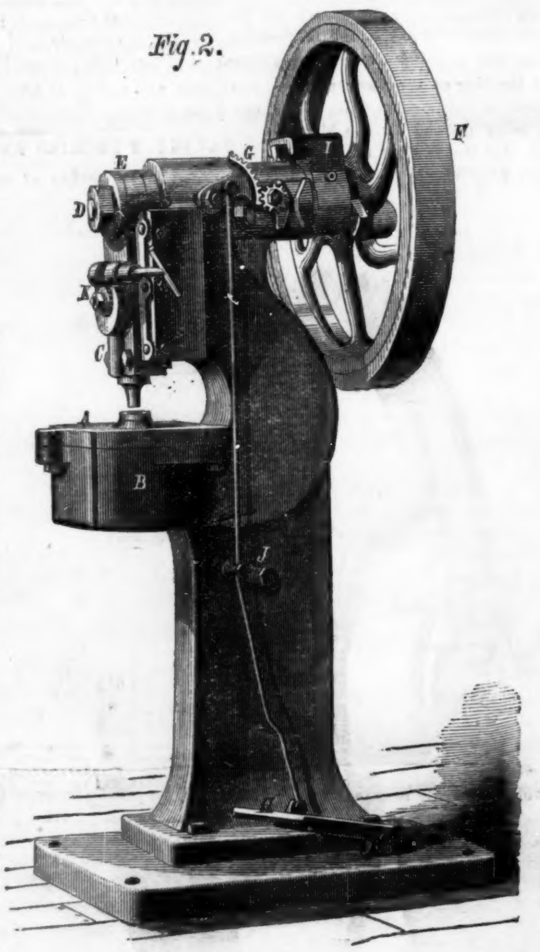
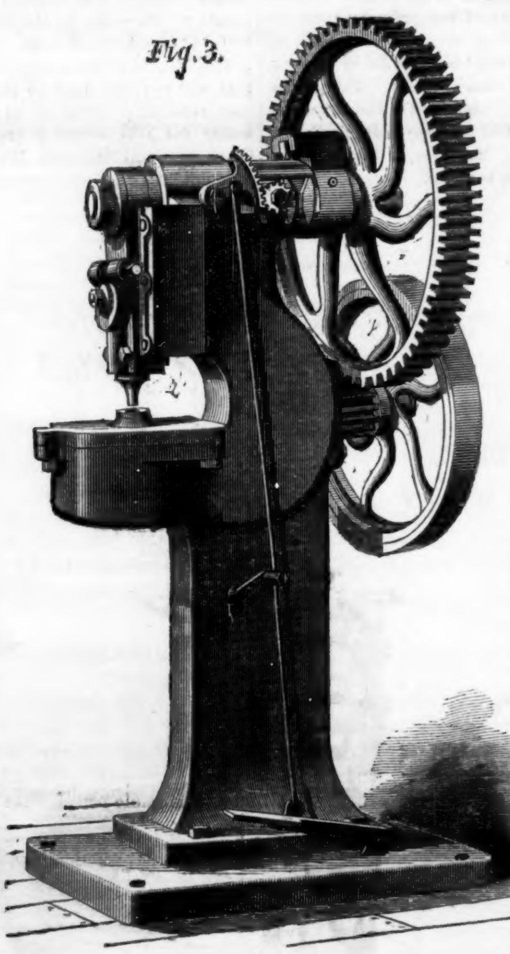


Fig. 3.



The pitman, E, is pivoted to the slide, C, at its lower end by an eccentric wrist pin, K. This wrist pin revolves in bearings in the slide, C, and forms the fulcrum for the pitman through which the latter moves the slide. Where surrounded by the pitman the wrist pin is eccentric to its journals. When the wrist pin is revolved, it changes the hight of the pivot or fulcrum relative to the punch, and thus not only varies the distance to which the punch is depressed in working, but also compensates for the wear of the latter and of the die. The front end of this wristpin is enlarged, and is made with a toothed periphery as a worm gear, and is so arranged that, by turning the worm which is carried in journals formed upon the slide, C, the punch may be raised or lowered to any desired extent.

Fig. 3 shows a geared press of the same size and description as that shown in Fig. 2, but having a geared train such as would be used where the rapid motion of the plain flywheel would be objectionable.

These presses are now made in a large variety of forms, adapted to all kinds of work, by the New York Steam Engine Company, 121 Chambers street, New York, to whom application should be made for further information.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the months of June and July, 1872:

During these months, 1,680 visits of inspection were made, and 3,440 boilers examined—3,371 externally, and 1,336 internally—while 357 were tested by hydraulic pressure. The defects in all discovered were 1,804, of which 347 were regarded as dangerous. These defects were as follows:

Furnaces out of shape, 78—18 dangerous; fractures, 180—90 dangerous. These defects have been generally around the heads and fire sheets. Some instances have been discovered where mud drums have been badly burned. This comes about frequently from malconstruction. The sheet to which the water leg connecting with the boiler is attached should over lap the sheets on either side, so that any steam generated in the mud drum may find easy escape into the boiler. If, on the contrary, the sheets on either side of the water leg over lap, the point of escape to the boiler is depressed by the thickness of one sheet, and steam generated in the drum will accumulate at the higher points on either side and remain, having no means of escape. By thus keeping the water from contact with the iron, the plate may become badly burned and consequently fractured. Mud drums are so situated that they are frequently subjected to intense heat, especially on the top. Burned plates, 127—54 dangerous; blistered plates, 253—27 dangerous; sediment and deposit, 293—20 dangerous; incrustation and scale, 328—13 dangerous; external corrosion, 129—28 dangerous; internal corrosion, 54—22 danger ous; internal grooving, 43—8 dangerous; water gages defective, 68—12 dangerous; blow-out defective, 20—15 dangerous; safety valves overloaded and out of order, 46—14 dangerous. It takes a long time for some engineers to understand that when a safety valve leaks steam, it is kept from its seat by some foreign substance, or that it needs grinding. If an engineer does not understand how to properly manage his safety valves, he should seek information at once. During the past month, a case was found where the engineer had cut a brace and driven it between the safety valve lever and the joist over head. When inquired of for a reason for such practice, he said "it was to save steam!" Let every engineer say, "Such shall never be my practice." Pressure gages defective, 195—28 worthless. These defective ones varied from —7 to +35. It will be readily seen that a steam gage 20 or 30 pounds out of the way is a very unsafe boiler attachment. Gages should be frequently compared with some standard or gage known to be correct. These attachments are very much neglected as a general thing. Boilers without gages, 19—5 were running very high pressure, and hence were regarded as dangerous; deficiency of water, 12—6 dangerous; braces and stays broken, 41—23 left the boilers so poorly supported and secured that they were in a dangerous condition; mud drums condemned, 4; steam drum condemned, 1; boilers condemned as beyond repair, 12.

Duration of Electric Spark.

Two methods have hitherto been employed in the determination of this. One is that of Wheatstone, in which a small mirror is made to rotate at a high velocity round an axis in its own plane, and the image of the spark is observed in it. In this way the discharges from batteries have been made to give images elongated in the direction of rotation; showing a sensible duration in the spark. By measuring the elongation and the velocity of rotation, the duration may be ascertained.

The other method is that of Arago, in which a disk with white sectors on a dark ground is made to rotate about an axis perpendicular to its plane, and the enlargement of the sectors in the light of the spark affords a means of determining the duration of the latter.

MM. Lucas and Cazin recently described to the Paris Academy a method which gives somewhat more precise results, and on which a committee of the Academy have reported favorably.

They employ a movable disk (made of plates of mica), the rim of which is situated between the observer's eye and the spark. On the rim are traced very fine lines, transparent and equidistant, and which are obtained by photographic reproduction. This disk is placed before a second opaque disk of the same diameter, which is fixed, and has on its rim seven fine lines, comprising six divisions, with a width which is equal to five divisions of the movable disk, so that this second disk forms a vernier, by which the one sixth of a division of the first disk may be estimated.

The spark appears in the focus of the lens of a collimator, which gives the rays (passing to the vernier) a direction parallel to the axis of rotation of the movable disk. On the opposite side of the disks, a small telescope is placed for observation of the luminous effects.

If the spark has an inappreciable duration, the observer may either see a bright line or he may not. In the former case, the spark appears at the moment of coincidence of a line on the movable disk with one on the fixed disk; in the latter case, the spark appears between two coincidences. There is, however, a certain probability of coincidence of lines and spark, depending on the breadth of the lines on the disks, and also the number of those on the vernier. This has been determined experimentally for the apparatus now considered, and found equal to 0·70; that is, if an instantaneous spark be produced at any instant, then, out of 100 instances, it will give a bright line 70 times, while 30 times it will give none.

Suppose, now, the duration of a spark is a little greater than that of the passage of a line on the movable disk before two lines on the vernier: then, if the commencement of the spark happens at the instant of the first coincidence, the bright line from this coincidence will (owing to persistence of impression on the retina) continue visible at the time at the second coincidence, and two lines will thus be seen of once.

If, with the same duration, the spark commences between two coincidences, it will have ceased when the third arrives. And thus there will only be one bright line, that from the second coincidence. In this way (as the committee point out) there may be either one or two bright lines for the same duration of spark. But if the duration of the spark be greater than that now spoken of, it will be comprised between two numbers that are easily determined, the difference of which is equal to the time elapsing between two successive coincidences. A very close approximation may be arrived at, and the inventors of the method show that, in virtue of the above mentioned probability of coincidence, by noting the total number of lines observed from a given number of sparks, and the velocity of rotation, the duration of the spark may be pretty accurately determined.

We cannot see at the same time more than a limited number of coincidence lines, so that if they exceed five or six, the velocity of rotation ought to be diminished.

By duration of the visible spark is to be understood the time elapsing between the instant at which the spark commences and the instant when, owing to a diminution in luminous intensity, it ceases to illuminate sufficiently the lines of the apparatus, so as to give a sensible image to the observer. The entire duration may be much greater.

The committee further remark that the duration of the spark being determined by the number of coincidences seen by the observer, if the degree of illumination of the lines were much diminished, it is to be feared that the number of coincidences would not diminish equally, in consequence of the enfeeblement of the light corresponding to the end of the discharge. And they think it would be of use to ascertain the effect of variations in luminous intensity, as in discharge between electrodes of various metals, placed at different distances, in gases at different pressures.

The proposers of the method have not been able to make appreciable the duration of a spark from an ordinary machine; but they found the duration of the discharges of condensers varies with the surface of these, with their arrangement, and the resistance of the circuit. It varies, also, with the striking distance, the nature of the balls, and the humidity of the air. In general, the duration increases with the condensing surface, and with the distance between the balls, and diminishes with the length of the circuit.

The limits of duration, given by their observations, are four millionths of a second, and eighty six-millionths of a second, with a possible error of one millionth of a second.

WHEN two or more colors are mixed together, the hue produced does not result from the loss of the particles of either of the colors by absorption or chemical changes of any kind. The microscope reveals the fact that minute particles of each color remain entirely separate.

A NEW green pigment, said to be brilliant, is composed of twenty parts of oxide of zinc and one of sulphate of cobalt, mixed into a paste, with water, and exposed to a red heat.

A LIST OF VELOCITIES.

Dr. E. Hartig, one of the professors of the Royal Polytechnic School at Dresden, has recently published a catalogue of the various velocities at which machinery, etc., should be run, as well as of the speeds at which many natural phenomena take place. The following is a translation of Dr. Hartig's list, made for this journal by Dr. Adolph Ott, who commences by giving the following explanation of the figures:

The velocities given in the following list are indicated in meters per second, and are arranged progressively by the figures. One meter being 39·37 inches, very nearly, it is only necessary to multiply the number with the values expressed, in order to convert them into the denominations in use in this country. For example: 0·11 meters (the usual average cutting velocity in turning wrought iron) is equal to 0·11×39·37=4·33 inches. The notation officially adopted in the German empire is for meter, m; for decimeter, dcm; for centimeter, cm; for millimeter, mm. The great completeness and the excellent selection of the list appended, which contains many numbers otherwise difficult to obtain, give it a lasting value.

0·010 Average velocity of the burning of Bickford's fuse.
0·015 Velocity in turning the outside of case-hardened cylinders.
0·015 Most preferable peripherical velocity of iron roll trains and rail bending machines.
0·018 Average velocity of the movable shear blade in parallel shears, and of the punch in a punching machine.
0·025 Working velocity of the opener (willow) and beater for cotton, measured at the licker-in.
0·030 Average peripherical velocity of the screw tap and dies in screw cutting engines.
0·040 Average working velocity of shearing machines.
0·040 Working velocity of the twisting frame for short wool.
0·050 Average cutting velocity in turning, boring, and planing steel.
0·060 Peripherical velocity of the rotary cylindrical rag boiling apparatus, used in paper manufacture.
0·064 Average working velocity of the doubling machine for silk.
0·070 Greatest velocity of water at which deposits of mud and fine sand (to the size of one half mm. for quartz) in rivers are not carried off (Telford, Rittinger).
0·075 Working velocity of paper machines in making strong pasteboard, according to Püschel.
0·080 Average working velocity of the gig mill (cloth manufacture).
0·080 Medium cutting velocity in turning, boring, and planing cast iron.
0·10 Best working velocity of sheet iron rolling machines.
0·10 Medium working velocity of cloth drying machines with endless stretching chains (Semper).
0·10 Velocity of an ascending water current, whereby angular quartz grains of 1 mm. in size are retained in falling suspension (Rittinger).
0·11 Average cutting velocity in turning, boring, and planing wrought iron.
0·13 Average working velocity of cloth brushing machines.
0·14 Working velocity of shear machines for short wool.
0·14 Velocity of an ascending water current, in which angular quartz grains of 2 mm. size are retained in suspension (Rittinger).
0·15 Greatest velocity of water whereby deposits of rich clay in rivers are not carried away (Telford).
0·15 Medium cutting velocity in turning, boring, and planing hard brass.
0·19 Velocity of an ascending water current, in which angular quartz grains of 4 mm. size are retained in falling suspension (Rittinger).
0·20 Working velocity in drawing the strongest iron wire.
0·21 Peripherical velocity of paper rollers in the smoothing machines of paper mills (Püschel).
0·24 Proper working velocity of the pitch chain of a river dredging engine.
0·25 Peripherical velocity of wood when turning it off with hand tools.
0·33 Best working velocity of steam drying machines for cotton fabrics.
0·35 Best peripherical velocity of the cutter in cutting cast iron and wrought iron cog wheels.
0·35 Working velocity of the paper machine in making thin writing paper (Püschel).
0·40 Medium velocity of the water in the upper and lower channels of hydraulic motors.
0·44 Best cutting velocity of the chisel in mortising machines.
0·47 Best peripherical velocity of rollers for breaking ores (Wertheim).
0·60 Proper velocity of the oxen in the whimsey.
0·63 Greatest velocity of the water in rivers whereby deposited sand of 10 mm. size is not set in motion. (Telford, Rittinger).
0·67 Greatest admissible velocity of the shuttle with a silk weft.
0·67 Most advantageous velocity of the elevators for grain.
0·70 Medium peripherical velocity of bruising mills for oil seeds.
0·75 Most advantageous velocity of the hackle bars in flax heckling machines.
0·75 Average working velocity in calendering fabrics.
0·75 Most advantageous velocity of cranks turned by manual power.
0·80 Most advantageous peripherical velocity of revolving cutters and rotary shears.
0·80 Most advantageous velocity of an ass in a winding engine.
0·83 Greatest admissible peripherical velocity of the sieves in the concentration of ores (Rittinger).
0·90 Most advantageous velocity of the horse in the whimsey.
0·92 The maximum velocity of water whereby round pebbles of 20 mm. diameter in rivers and streams are not set in motion (Telford, Rittinger).
0·95 Average velocity in descending and ascending pit shaft.
1·00 Velocity of the air in a scarcely perceptible wind.
1·00 Most advantageous velocity of the water in the suction and pressure pipes of singly acting piston pumps.
1·00 Average working velocity of gassing machines.
1·10 Most advantageous working velocity of cloth washing machines and fulling mills.
1·30 Peripherical velocity of the pressing rollers in wool drying machines.
1·30 Working velocity in drawing fine iron wire.
1·32 Regulation velocity of a German foot soldier when on march (108 steps of 0·732 m. length per minute) and with full baggage (20 kilogrammes).
1·33 Greatest admissible velocity of the shuttle for linen yarn.
1·50 Average velocity of a pedestrian without baggage on a horizontal road.
1·50 Most advantageous peripherical velocity of rail rolls.
1·50 Most advantageous peripherical velocity of rolls for merchant iron bars.
1·53 Greatest velocity of the water in rivulets and rivers in which conglomerates and slate are not set in motion (Telford).
1·60 Most advantageous velocity of water in the suction and pressure pipes of double acting piston pumps.
1·67 Greatest admissible velocity of the shuttle for short wool (Streichgarn).
1·70 Medium working velocity of rollers for sheet iron.
1·80 Most advantageous velocity of chain steamboats in dead water.
2·00 Velocity of the air at a moderate wind.
2·20 Most advantageous average velocity of the shear blades of reaping machines (Perels).
2·30 Most advantageous velocity of fulling rollers for cloth.
2·44 Highest admissible velocity with which oats, bran, flour, etc., may be transported on an endless cloth, without being scattered by the air.
2·50 Average cutting velocity of veneer saws.
2·50 Most advantageous peripherical velocity in rolling refined iron.
2·50 Highest admissible velocity of the shuttle for combed wool yarn.
2·54 Highest admissible velocity in pits for the descent of miners.
2·75 Highest admissible velocity for the transportation of heavy and clean grain on an endless cloth.
3·00 Highest admissible peripherical velocity of the rollers in wire mills.
3·00 Peripherical velocity of the cutters of the culling willows in spinning carded wool.
3·33 Highest admissible velocity of the shuttle for cotton yarn.
3·36 Relative velocity between the cloth cylinder and shear cylinder in long shear machines for cloth.
3·50 Most advantageous velocity of street gas in pipes.
3·68 Highest admissible velocity of the drawing in pits for the ascent of miners.
4·00 Velocity of the air at a fresh breeze.
4·00 Highest admissible peripherical velocity of drills in wood.
4·00 Average velocity of river steamers in still water.
4·50 Most advantageous peripherical velocity of the drum in Taylor's cotton opener.
4·50 Average peripherical velocity of the cutting tool in cutting toothed wheel work.
4·75 Relative velocity between cloth cylinder and brushing cylinder in brushing machines for cloth.
5·00 Average velocity of marine steamers.
5·00 Average peripherical velocity of the whetstones used for grinding chisels.
5·00 Peripherical velocity of wood in turning it in a slide lathe.
5·10 Average peripherical velocity of the cylinder of carding machines for sheeps' wool.
5·60 Average peripherical velocity of the cylinder in breaking, and fleece cards in spinning, short wool.
6·50 Most advantageous velocity of the air for the working of windmills.
7·00 Average peripherical velocity of the cylinder in the manufacture of paper.
7·43 Most advantageous velocity of the rag knives in rag cutting machines.
8·00 Most advantageous peripherical velocity of the cylinder in the cotton carding engine.
8·50 Most advantageous peripherical velocity of the grindstones of Voelter, which are now being used for the conversion of wood into paper pulp.
9·00 Velocity of the air in a fresh wind.
10·0 Highest advisable peripherical velocity of millstones.
10·0 Most advantageous peripherical velocity of fine grained grindstones.
10·0 Most advantageous velocity of the blade in endless saws.
10·0 Medium peripherical velocity of the large grindstones in machine shops.
10·0 Most advantageous velocity of the air in the conduit pipes of blowing engines.
12·5 Highest admissible velocity of the freight trains on the German railways.
13·5 Most advantageous peripherical velocity of the cylinder of the breaking card and finishing card for hemp.
15·0 Medium peripherical velocity of the cylinder in the openers in wool spinning mills.
15·0 Most advantageous peripherical velocity of emery wheels for polishing and finishing off.
15·0 Velocity of the air in very high winds.
18·0 Most advantageous peripherical velocity of the cutter heads of wood shaping machines.
18·0 Medium flying velocity of the carrier pigeon.
20·0 Highest admissible velocity of passenger trains on the German railways.
25·0 Highest admissible velocity of express trains on the German railways.
25·0 Highest admissible peripherical velocity of large grindstones, consisting of the best material, in machine shops.
25·0 Most advantageous velocity of the driving rope of cranes, in the system of Ramsbottom.
27·0 Most advantageous peripherical velocity of the emery wheels in saw sharpening machines.
30·0 Velocity of the transmission of the irritation in the sensatory and motatory nerves (Preyer).
35·0 Highest admissible peripherical velocity of a cotton beater.
35·0 Medium flying velocity of the swallow (Sonnet).
37·0 Flying velocity of the eagle (Simmler).
40·0 Most advantageous velocity of circular saws for wood and hot iron.
50·0 Most advantageous peripherical velocity of centrifugal machines for woolen cloth and other fabrics.
60·0 Highest peripherical velocity of the tappets in the attrition mill of Carr, for pulverising the hardest materials.
75·0 Most advantageous peripherical velocity of the cylinders of rag devils in the manufacture of shoddy.
332·77 Most probable value of the velocity of sound in open dry air at a temperature of 32° Fah., according to the computation of Schroeder van der Kolk (1865) from the experiment made in 1823 by Moll and Van Beck at Utrecht.
7,263·75 miles. Velocity of voltaic currents in telegraph wires, according to experiments made by Plantamour and Hirsch.
11,433·55 miles. Velocity of induction currents in telegraph wires, according to experiments made by Plantamour and Hirsch.
185,164 miles. Velocity of light, according to experiments of Foucault.
288,004·8 miles. Velocity of the discharging current of a Leyden jar in a copper wire of 1·70 millimeters thickness, according to Wheatstone.

Distillation by Cold.

Alfred H. Smee, the inventor of the voltaic battery named after him, has communicated to the Royal Society a method which he has devised, and which he names "distillation by cold," by which he believes the detection and determination of ammonia and other organic impurities existing in the atmosphere will be greatly facilitated.

A glass funnel—usually of 8 or 9 inches—is drawn to a point and closed. It is supported in an ordinary stand, and filled with ice. Condensation of the watery vapor of the atmosphere then takes place; the dew collects into drops, which trickle down the outside of the funnel, and at last fall from the point, under which a small receiver is placed to catch them. The total quantity of liquid collected in a given time is measured, and the quantity of ammonia determined by Nessler's test.

By the method of distillation by cold, the author found it possible to distil many substances which are decomposed at a high temperature. Thus many delicate odors of flowers were distilled by placing the flowers under a bell glass sufficiently large to cover the funnel containing the ice. The odors were found to be more rapidly and completely abstracted by placing a dish with a little ether under the bell-glass at the time of distillation.

The paper was accompanied by tables giving the results obtained in 107 experiments, together with the atmospheric conditions prevailing at the time. The experiments were made in a garden, in a bedroom, in hospital wards, in the open country, etc. A few of the numbers obtained are here given by way of example:

Fluid collected, in minims.	Ammonia in grs. per gallon.	Source.
150	1·9742	Erysipelas.
120	0·1791	Garden.
55	6·8807	Drains.
90	2·1000	Bedroom.
	2·9568	Stables.
150	0·0985	Victoria Park

THE celebrated cathedral of Canterbury, England, was badly damaged by fire on September 3. The same sort of carelessness that has led to the destruction of many other valuable public buildings by fire was the occasion of the present injury, namely, a charcoal furnace, used by workmen who were repairing the roof, was accidentally upset. One hundred feet of the roof was completely destroyed. This cathedral is one of great antiquity, dating back to A. D. 500; many important historical events are with it associated.

Two new locomotives have recently been put in use at Connellsville, Pennsylvania, for regulating purposes, or for making up trains. These locomotives have bumpers on both ends, the tender is done away with, and water is carried in a tank placed over the boiler. The fireman's foot board is so made as to hold sufficient fuel for several hours' consumption,

IMPROVED FLUSH STRAP HINGE.

The chief defect of the ordinary strap hinge, such as is used for hanging trap or scuttle doors, has been that the joint made by its two parts forms a projection above the floor or roof which, being very easily overlooked, proves a stumbling block and thus a cause of troublesome accidents. To remedy this difficulty, the invention shown in our illustration is devised. It consists of what is known as a flush strap hinge, so constructed as to present a perfectly smooth surface and be hardly observable when the door is closed, while it permits the latter to be swung all the way back when opened.

Fig. 1 shows the device in perspective; Fig. 2 is an edge view with the door, A, closed, and Fig. 3, a similar view with the door open. Referring to all three engravings, B and C are the straps of the hinge, on which are formed eyes, which tightly enclose the pivot pins. D, shown more clearly in Fig. 1, is a clasp, which is received in the openings cut in the parts of the straps which form the eyes, and the ends of which are bent around and move freely upon the pivot pins. It will be seen that a double joint is thus formed whereby the hinge when extended as in Fig. 1 presents on its upper portion a uniformly flat surface. E is a plate attached firmly to the strap, C, and projecting under the eye of the strap, B. Its object, as shown in Fig. 2, is to receive and support the inner edge of the closed door. Fig. 3 plainly represents the location of the different parts with the door open and also shows the movement of the hinge in permitting the door to be thrown flat back, the clasp, D, working freely around the pivot pins and eventually assuming with the latter a perpendicular position.

This useful invention, which will doubtless attract the attention of architects and builders, is manufactured by the Stanley Works at New Britain, Conn. Patented through the Scientific American Patent Agency, January 3, 1871, by J. S. Jenness, of Bangor, Maine, of whom, or by addressing Mr. A. T. Young, agent, 139 Federal street, Boston, Mass., further information may be had.

GOLD PEN MAKING.

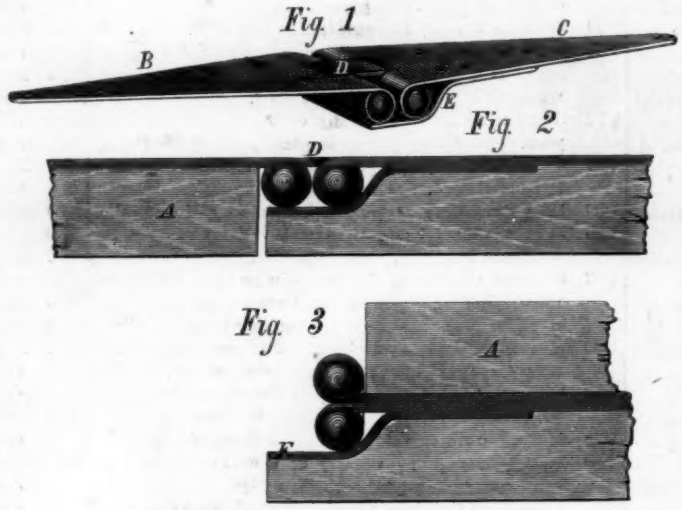
Pure gold, pure silver, and pure copper are the materials from which the alloy used in the manufacture of gold pens is made. Gold alone, from its softness, cannot be used, but combined with the baser metals, in degrees of 14, 16, and 18 carats, it forms a composition of great hardness, durability, and elasticity.

If the reader will accompany us in imagination through one of the manufactories in this city, the largest perhaps of its kind in the world, owned by Messrs. Mabie and Todd, we will endeavor to point out the many ingenious processes through which the metal, or rather the alloy, passes from the time it undergoes its first melting to its final exit into the world in the shape of finished pens.

Our attention is first called to the uncombined metals; virgin gold in little irregular shaped nuggets so soft as to be easily scratched by the thumb nail, silver in like form, and copper in odd pieces of wire and thin plate. Into a delicate pair of scales, certain portions of each of these metals are thrown. A nice adjustment of weights, a few seconds of wavering of the beam, and, the operation being finished, the contents of the scale pan are handed over to the melter. This workman we find busily engaged in blowing a small charcoal fire made in an open furnace. As soon as a fierce heat is obtained, a hole is raked in the coals and a small crucible containing the metals placed in the fiery bed. More coal is heaped on, the blast is made stronger, and we can see the crucible gradually turn white hot as the fire increases. Meanwhile, the workman is preparing his mold, two simple pieces of iron which, fitting close together on their edges, leave a space between for the shaping of a small ingot. This he places conveniently at hand, and then, with his tongs, lifts the crucible from the fire. Out flows the metal, a liquid stream of dazzling brilliancy. A moment of waiting, the mold is opened, and a dull yellow ingot lies before us; seizing it with his pincers, the melter thrusts it among the coals. This is the annealing process, and we watch the bar gradually turn to a deep cherry red. Then it is quickly withdrawn and plunged, hissing, into a bath of very weak sulphuric acid water. It cools quickly, for not a minute seems to elapse before the ingot is placed in our hands for examination. It is about a foot long, two and a half inches wide, and about three sixteenths of an inch thick. Its value is about $250. A small set of rolls, which a workman has been adjusting during our inspection of the ingot, is now ready. The machine is set in motion, and into it passes the bar of metal: once through, it is very slightly flattened but not much changed; back again, the workman tries it with his gage, but it is far too thick. It goes between the rollers again and again, until finally the before solid bar is but a thin ribbon of elastic metal. Thin, we say, but still much too thick for its final condition in the shape of pens.

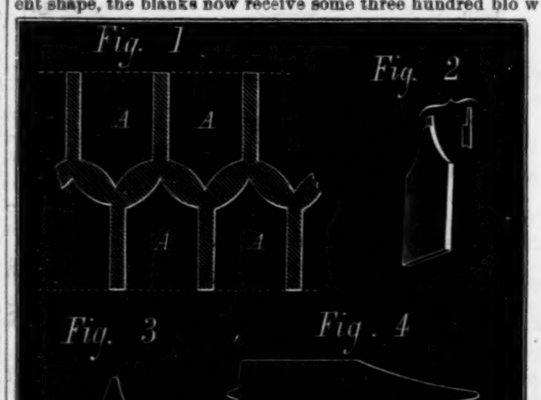
Thus prepared, the gold is passed to another operative who proceeds to cut it into blanks; that is to say, he holds the ribbon under a small press, in which a punch and a die of the proper shape and size are fitted. By this means, the first crude form of the pen—the blank—is cut out in the shape shown in the engraving, A, Fig. 1. The ribbon of metal, after these pieces are removed, is more particularly intended to be shown by this illustration, the blanks being so cut out as to economize material to the greatest extent.

A quantity of blanks being completed, the next process is to fit them with so-called "diamond" points. A gold point would wear away almost immediately; even platinum is incapable of resisting the friction of constant use. Consequently the point of the pen is tipped with a very hard substance: not diamond, as is popularly supposed, for these gems could not be soldered to the gold and could only be attached by a setting which would render the pen useless to write with: but iridium, a rare grayish white metal furnished for the purpose in fine grains, costing about $150 per ounce. It is generally obtained from gold bearing ore, and is often found in the bottom of crucibles after gold has been melted in them. It is separated from the latter metal by the action of *aqua regia* which dissolves the gold, leaving the iridium untouched. By another process, the gold thus put in solution is regained. To place the iridium point, the blank must be fitted to receive it. This is done with great rapidity by a



JENNESS' FLUSH STRAP HINGE.

small revolving stone which cuts a piece from the end of the blank, as shown enlarged in Fig. 2. Some twenty blanks, being thus prepared, are ranged on a table before a workman, who, with the aid of a lens, selects bits of iridium of the proper size to fit the points. These bits he places in the notches before cut, together with a drop of a solution of borax and water. Then picking up each carefully, he spreads the blanks along on a piece of charcoal, and brings to bear, by means of a blow pipe, upon every point an intense flame. The gold around the nibs is thus fused, and the borax, forming a flux, flows around and solders the iridium firmly into position. The blanks are next passed through sets of rolls until they are squeezed into the shape shown at Fig. 3, the metal, of course, being rendered much thinner by the compression. The rolls employed are steel cylinders, on the lower one of which is an arrangement whereby the iridium point of the blank is prevented from receiving any pressure, as in such case it would be crushed or broken. In their present shape, the blanks now receive some three hundred blo w



of a hammer, the object being to give them temper, elasticity and hardness. They are then placed under another punch which, descending, forces the metal into a die, whence it emerges shaped as shown in Fig. 4, a small projection termed a "tit" being left at the end in order to guide the pen during subsequent operations. While the pen is in this condition, the manufacturer's name, its number, etc., are stamped upon it.

If the reader will examine an ordinary gold pen, he will notice that its shape is peculiar, that its middle portion is constructed on a curve of much greater radius than the upper part, while around its nibs and point the metal is almost flat. In order to change the pen from its present form—a simple flat blank—to the required shape, a very ingenious machine is used. Described briefly, it consists of a convex plunger, of a length equal to that of the pen, which fits into a concave die of steel placed beneath it. The blank being laid above this lower die, the plunger descends upon it, forcing it into the concavity of the former; at the same time two concave horizontal hammers strike the pen at either side, thus turning up its edges around the vertical plunger. A perpendicular section of this instrument is outlined in Fig. 5. A is the plunger, B, the die below, C C, the horizontal hammers, while the section of the blank is shown in position between the parts.

So far as form goes, our pen is now complete, but it is as useless as ever as a writing implement. The slit at the points is yet to be cut. This is done by very thin circular sheets of refined copper, covered with fine emery flour and oil and revolved with great rapidity. Each sheet is held by clamps, which are dressed to perfect trueness. Against the edge, the point of the pen is pressed; and in a few revolutions, it is cut through. This process requires the utmost accuracy and delicacy of perception, as the slit must be directly in the middle, a cobweb's breadth to either side ruining the pen. A steel knife fixed in a kind of hand stamp next lengthens the slit, the upper end of which is cut square by means of a rapidly revolving and extremely fine saw.

The pen now passes to the grinders. These men have before them a number of copper cylinders, of varying diameters, which are covered with a paste of emery and oil. To these the points and sides of the pens are held. As fast as a little metal is removed, the pen is tried and the somewhat tedious process is continued until the operator is satisfied that his work is complete. The inside of the pen is then smoothed with a kind of steel burnisher, and finally a cutting wheel is allowed to rotate for a second or two in the slit to remove any roughness which may remain. The pen is next polished by holding it against revolving cylinders made of circular layers of felt. The outside surface of the cylinder is composed of the edges of the layers, and is covered with a mixture of fine German tripoli and candle wax. The inside of the pen, which cannot be reached by this method, is burnished by a small revolving spindle covered with cotton and jeweler's rouge. Rubbing with Scotch hone roughens or frosts the metal inside of the nibs, and so prevents the ink flowing too rapidly to the point. Lastly, the pen is sent back to the grinder, who sets the nibs and adjusts the pen to write with perfect smoothness. Nothing now remains to be done but to pack the finished pens in boxes and send them to the market.

The bar of gold, which we first saw cast and which we valued at $250, is now made into pens worth $350, and yet over 40 per cent of the metal has been lost or unused during the processes of manufacture. The unused gold is in the form of scraps and cuttings, which are remelted. Ten per cent, however, of the entire amount of the gold brought into the factory is irretrievably lost. It is carried off in fine particles on the clothes, disappears in the machines, is blown away by drafts, and, in fact, it is hardly known what becomes of it. Every year a large quantity of metal is reclaimed from the water the workmen wash in, from their working clothes, and from the sweepings of the factory. In the establishment visited by us, where 60 hands are employed and 1,500 pens are produced weekly, eighty dollars worth of gold has been found in the dirty water during a period of six months, and it is estimated that $1,500 is yearly reclaimed from the sweepings and refuse.

Curious Preservation of a Dead Body.

At South Bend, Ind., the body of a deceased lady, buried ten years ago, was lately uncovered for re-interment, when the corpse was found to be in an excellent state of preservation. Although petrification had not taken place, the body was as perfect as the day it was placed in the coffin. The whole body was perfectly preserved, even to such parts as the tongue, which could be moved back and forth in the mouth. The expression of the face was retained and the color of the flesh was natural, except for its waxy appearance. The shroud, when exposed to the air, fell to dust.

If the chemical nature of the soil were known, and also the medicines administered during the sickness of the deceased, it is possible that the reason for this singular preservation might be ascertained. From the description given, it would seem as if it might be due to the presence of arsenic.

White Building Stone.

For a number of years, people have been aware of the existence of a valuable building stone, found between Glasgow Junction and Cave City, Ky., and have long been in the habit of resorting to its bed for the purpose of securing its rich treasures for hearth stones, window sills and step stones, and other purposes requiring a handsome and durable stone. When first taken from its bed it presents a bright gray appearance, which, upon exposure, fades to a beautiful white, slightly shaded with the faintest gray. A company has been organized under the name of the "Glasgow Granite Company," for the purpose of extensively mining and introducing this peculiar stone.

Progress of Iron Manufacturing in Kentucky.

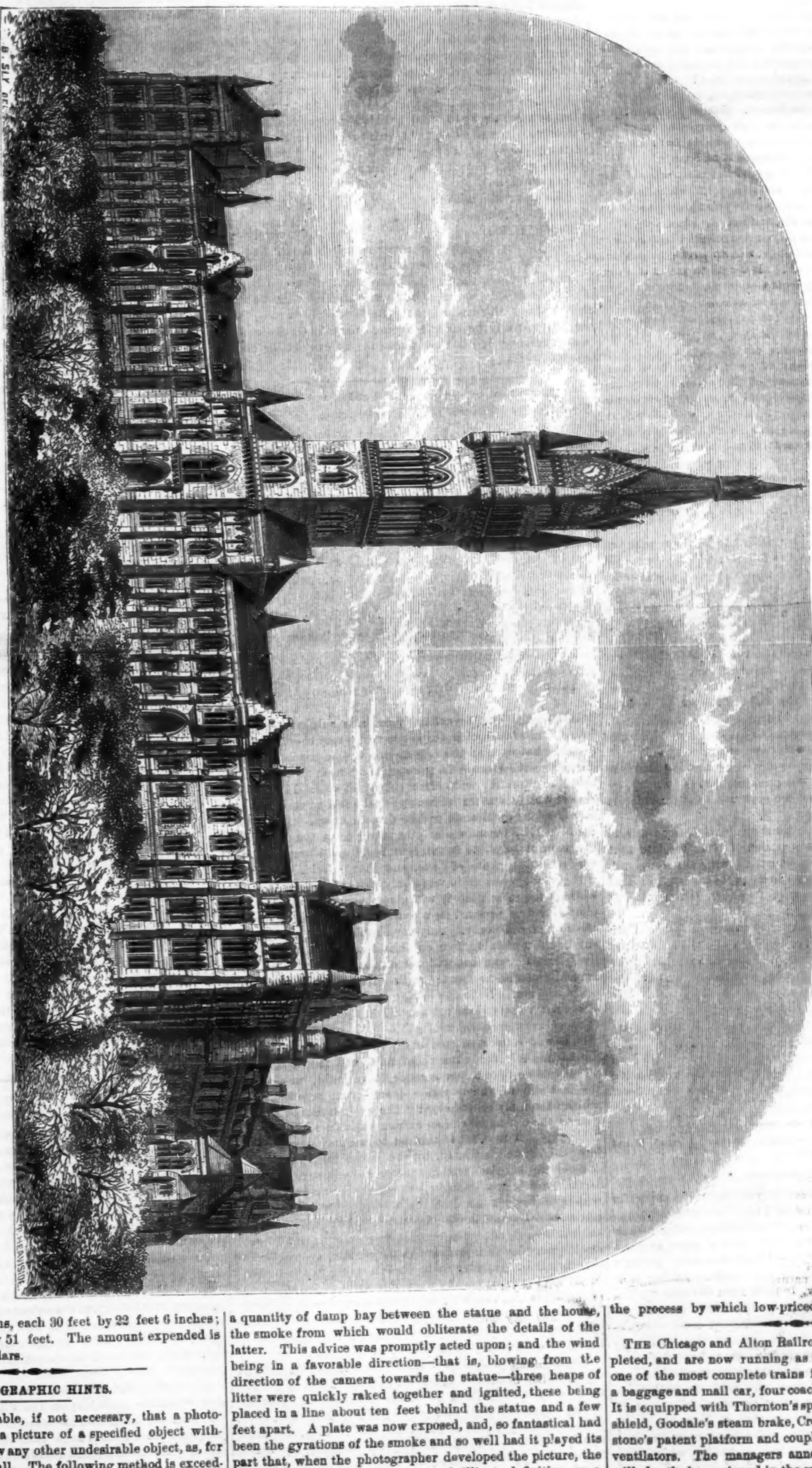
A large furnace and nail factory is building at Ashland, Ky. The capital stock of the new company is $700,000, and nearly the entire amount has been raised. The furnace will have capacity for turning out fifty tons of pig iron a day, to be converted into nails. Ashland and the district around it has been demonstrated, and is by iron men generally conceded, to be the place in the United States where iron can be most cheaply manufactured. It is beautifully situated on the Ohio river, with an excellent harbor, and is a fine site for a large city.

GLASGOW UNIVERSITY BUILDINGS.

The University of Glasgow (Scotland) having sold its old site and buildings to a railroad company, erected a new structure on Gilmore Hill, in the suburbs of the city. Sir George Gilbert Scott was commissioned to prepare plans for the erection of a new building, large enough to accommodate the rapidly growing institution, to be built in a style worthy, both as to solidity and beauty, of the purpose for which it was destined. Of the extent of the new structure, some idea may be formed from our engraving. It is a large oblong rectangular pile, about 600 feet long by 300 feet wide, and divided in the middle by a building which separates two quadrangles, each of which is about 180 feet square.

The great tower in the center forms the main entrance for the students; on the first floor is the court room, with direct communication into the great forehall. Besides the belfry, clock room, etc., in the upper stages, there is the cold air chamber in the sub-basement, through which every hour 1,000,000 cubic feet of fresh air are to pass, for the supply of fresh and hot air for the heating and ventilating of the whole building, the cold air chamber being fed through four large extraction shafts, in hight about 150 feet. The tower is 200 feet; the wooden spire, covered with lead and slate 110 feet high. With each class room is a professor's private room, in connection with a mezzanine above, fitted up as a private library or museum, as the case may be. On the ground floor is the valuable collection of books and coins by Dr. Hunter, from whom it derives its name, the Hunterian Museum. The library contains over 100,000 volumes, with extensive premises for workshops, etc., in the basement. The attics are used for model rooms and museum purposes. The professors' court, at the west of the college buildings, consists of 13 houses. The students' recreation ground contains about 5 acres.

The dimensions of some of the principal apartments are as follows: Library, 129 feet by 60 feet; museum, 129 feet by 60 feet; central hall, 114 feet 6 inches by 70 feet; Latin, chemistry, natural history, and Greek class rooms, each 40 feet by 40 feet; laboratory, 52 feet 7 inches by 34 feet; moral philosophy, 37 feet 10 inches by 34 feet; physiology, 34 feet by 34 feet; medica jurisprudence, 34 feet by 30 feet; small museums, each 30 feet by 22 feet 6 inches; reading room, 73 feet by 51 feet. The amount expended is over two millions of dollars.



GLASGOW UNIVERSITY BUILDINGS.

PHOTOGRAPHIC HINTS.

It is sometimes desirable, if not necessary, that a photographer be able to take a picture of a specified object without including in the view any other undesirable object, as, for example, an old brick wall. The following method is exceedingly suggestive, and, if skilfully managed, very good. We once saw it practically tested by a photographer under the following circumstances:

In a certain garden in London, there is a beautiful statue of black marble which had been repeatedly brought under the "eye" of the camera, but always without pictorial success, on account of the close proximity of one or two trees and a brick house, which were only twenty feet behind the statue, and which invariably appeared in the picture with a most unbecoming and undesirable degree of prominence. Having been consulted by the proprietor, we suggested that the offensive brick building might be excluded from the view presented to the camera, either by placing a large background of uniform color behind it, or, still more readily, by burning a quantity of damp hay between the statue and the house, the smoke from which would obliterate the details of the latter. This advice was promptly acted upon; and the wind being in a favorable direction—that is, blowing from the direction of the camera towards the statue—three heaps of litter were quickly raked together and ignited, these being placed in a line about ten feet behind the statue and a few feet apart. A plate was now exposed, and, so fantastical had been the gyrations of the smoke and so well had it played its part that, when the photographer developed the picture, the statue stood out in excellent, nay brilliant, definition on a background upon which neither trees or brick edifice were visible. The success of the experiment was most complete. In repeating this experiment, however, care must be taken that not a curl of smoke, even of the most delicate kind, be allowed to obtrude between the camera and the object being photographed, otherwise failure will be the certain result, for smoke is frequently of a highly intense actinic color.—*British Journal of Photography.*

Prices and Qualities of Rubber Springs.

So long as the market price of crude rubber rules as high as it now does and is likely to do for some time to come, the minimum price of a fair standard quality of spring cannot fall below fifty-five cents per pound.

The first essential of a good spring, says the *National Car Builder*, is a suitable quantity of fine Para gum, pure and dry. A good quality of fine sheet Central American may be used with the Para in proper proportion. These will absorb a certain amount of dry white lead and bolted whiting, but no more than is requisite. Sulphur is also used merely as a vulcanizing agent, its action being analogous to that of yeast in bread making. There is a definite and fixed relation between the quality of the pure or crude gum and the quantity of foreign ingredients necessarily combined with it, not for the purpose of adulterating and cheapening, but to impart to the mass of material constituting the spring a body and solidity it could not have in any other way. The cheap springs offered in the market do not contain more than twenty-five per cent of good gum, the remainder consisting of coarse and inferior grades, with old rubber frequently mixed with it, and capable of absorbing a much greater quantity of adulterating material than good and fine gum.

The tenacity, power, and durability of the spring are impaired just to the extent that bad material enters into its composition, and the foreign ingredients are out of proportion to the rubber. Springs can be made to weigh less by using less lead and more whiting, but the quality suffers in a corresponding degree, as the lead has a metallic and durable body, and the whiting a perishable one.

It requires but a very little figuring to form an idea of the adulteration of low priced springs. Fine Para rubber is worth to-day eighty-five cents in the market, and fine Central American sheet rubber sixty-five cents, and the difference between these prices and the lowest spring quotations indicates very clearly the nature of the process by which low-priced springs are produced.

THE Chicago and Alton Railroad Company have just completed, and are now running as day express on their road, one of the most complete trains in the world. It consists of a baggage and mail car, four coaches, and a palace dining car. It is equipped with Thornton's spark arrester and patent dust shield, Goodale's steam brake, Creamer's safety brake, Blackstone's patent platform and coupler, and Reniff & Buttolph's ventilators. The managers announce that the whole road will shortly be equipped in the same way.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Theology and Science.

To the Editor of the Scientific American:

As a constant reader of your paper, I was very much grieved and disappointed by your editorial on "Science and Theology" in your issue of Sept. 7, 1872.

I presume, indeed, upon what I know of scientific editorials in religious papers, that your criticisms may have been just with regard to the editorial which called forth your remarks; but I must strongly object to the style and facts of your reply.

Why do you entitle the Bible a "mutilated and obscure tradition?" Why do you treat that figure of speech, so often used not only in the Bible but everywhere else, called "anthropomorphism" (or representing God as man) as an "absurd assertion" and a "blasphemous idea?" That science has helped, and most wonderfully helped, to a true interpretation of the Bible cannot be denied. But why charge upon theologians a constant change in their interpretation of the Bible, while it is equally true that scientists have been as constantly changing their interpretation of Nature?

You and your readers will know what I mean when I say that the theory of "a single creative act," which has ever since been successively developing its principle in necessary results, is essentially of deistic, and not Christian, origin.

Again I would ask: Why do you as a scientist undertake to "judge the teachings of theology, and to decide which are true and which are erroneous?" It seems to me that an attempt to judge of theology from a scientific standpoint is just as absurd as to judge of science from a theological standpoint; and while you have been shocked yourself, as I have often been, with the mapping out of the Deity, so prevalent in the so called "orthodox" churches of the day, I have been shocked, as I doubt not many of your readers have been, with the whole style and manner of this editorial of yours, which only repeats the language and shows the spirit of certain scientists of the present day. Men who will labor days, weeks, months, and even years on a small point respecting molecular motion will afterwards, in the most careless, heedless and flippant way, dogmatize upon prayer and miracles, and the method of the Divine government. Nothing is more untheological than for men to theologize about science, and nothing is more unscientific than for men to scientize about theology.

But I do not stop here. I am willing to join issue with you on your statements as to facts as follows: "Theology taught that the earth was flat," "that the earth was a stationary center," "science proved that the earth was formed many millions of centuries ago," etc. Now I am ready to maintain that at no time have theologians asserted any thing different from what has been the accepted faith of scientists themselves, and that what was finally developed into the Copernican and Newtonian system was, since Christ, first originated among the Christian "theologians," as you call them. In St. Augustine's writings, you will find the antiquity of the earth suggested, and the very interpretation of the Christian narrative, which scientists pretend to despise as modern make shifts, announced, more than thirteen centuries ago.

Indeed I think that it may be proved by actual quotations that the Copernican system was promulgated, as a theory, by Christian theologians against the objections and the ridicule of the scientists of their days

In fact, whether this can be done or not, it does appear, to me at least, a gross misrepresentation of facts to state that theologians have made these assertions with any more confidence than scientists have made them themselves; or that they are the cast-off clothing of theology, rather than of philosophy.

The advance of science to-day is as antagonistic to the science of yesterday as it is to the theology of a thousand years ago. How lately was the fixedness of species a doctrine alike of theologians and scientists? But now behold we have the new doctrine of the evolution of species, held by both. It is just as difficult to harmonize the two theories as to harmonize the old with that new theology which is growing up around our scientific progress.

A few months ago you had a most excellent editorial on these very subjects, but now you have taken the unscientific position of the anti theologians, which you then denounced. Why is this? A THEOLOGIAN AND ALSO A SCIENTIST.

The One Hundred Thousand Dollar Canal Boat Prize.

To the Editor of the Scientific American:

I have been a constant reader of your valuable paper for almost six years, and in that time I have not seen anything in the paper to displease me until last evening, after returning from Buffalo. I picked up last week's paper, and saw therein an article headed "New Canal Steamer," giving a flattering account of Captain Goodwin's boat now being built at Buffalo. One would naturally infer from the account that Captain Goodwin's boat would certainly win the reward.

Such articles have a tendency to discourage other competitors for the prize, who make the remark that, if friends and relatives, money and secret orders are to have influence with the commission, the sooner that inventors who have not these advantages withdraw from the field the better, because the expense of building a boat for competition is great.

Besides, there is the opposition that an inventor meets around Buffalo and other ports. For instance, a man has his boat completed and removed from the docks; while going to some place of level water for trial, some little tug with a loaded boat will smash into her, giving her no chance for getting out of the way. It is ten chances to one that the damaged boat must return to the dock to repair, at the inventor's expense. These things are done because, if steam should be used on canal boats, the tug business will not be more than half as good as it was. These oppositions are enough, without their being backed up by such articles as that in No. 9 of present volume of the SCIENTIFIC AMERICAN. If the papers would but state the speed, construction, time of building or changing from the old canal boat, it would be a help to all instead of a detriment.

Now, as to the boat, it was distinctly understood by all that the boat was not to exceed 90 feet in length, nor 18 feet in width, because old canal boatmen say that some of the present locks (not all) are too small to let a boat exceeding these dimensions through. If this is the case, how is the Goodwin boat of 96 feet in length, together with the wheel in front and the peculiar construction in the rear for the connection of other boats, going to get through? Again, the law says the construction must be applicable to the old canal boat; and on the Goodwin plan it cannot be so with a boat carrying 240 tuns, or much over 210 tuns; but if new canal boats of such extensive dimensions as the Goodwin be permitted, others, of many principles, can carry 250 or 275 tuns. But most inventors want to come to the requirements of the law as nearly as possible.

I hope you will take no umbrage at this little statement of the feelings of many inventors.

Fagundus, Pa. A COMPETITOR.

[We are surprised that our correspondent should find anything in the article he mentions to justify a suspicion that "friends, relatives, money and secret orders" would be able to influence the commission, or a statement that we have "backed up" the conduct of the Buffalo tug boat men. Will he please read the article again? Captain Goodwin must suffer the loss of his time, trouble and money if his boat is too long.—EDS.]

Detection of Sulphuric Acid in Vinegar.

To the Editor of the Scientific American:

The question as to the value of a prescription, for the chemical manipulation of a common test, depends on its practical nature and by no means on the fact that a roundabout operation may be defended by an ingenious scientific reasoning. In the name of common sense, I ask what practical chemist, when he obtains several samples of vinegar to test for adulteration with sulphuric acid, will commence with going through all the operations described on page 120, of evaporation, cooling, trituration with alcohol, filtration, dilution with water, again evaporation, again filtration, and acidulation with hydrochloric acid before he applies the actual test with a soluble salt of barium? Surely any such will commence by applying this latter test at once, as mentioned by me on page 132, and, in at least ten cases out of twenty, he will find no precipitate, proving that neither free sulphuric acid nor sulphates are present. If so, he has disposed of the matter without much unnecessary trouble and loss of valuable time.

In case the vinegar naturally contains sulphates without being adulterated with sulphuric acid, every chemist of experience knows that the appearance of the precipitate produced by such a cause is quite different from that produced by an adulteration with free sulphuric acid. In the first case it will be a mere milkiness; in the second case, a much more copious precipitate will be thrown down. But if any doubt is left, advantage may be taken from the facts that the natural sulphate in vinegar is (if not always, at least very often) sulphate of lime, and that chloride of calcium will give no precipitate when only this sulphate is present; while at the same time it will give a precipitate if free sulphuric acid is present, in a quantity more than one tenth of one per cent only. Another simple test is the mouth; any liquid containing free sulphuric acid even in comparatively small quantities, will act on the teeth and take their natural smoothness away; while vinegar without mineral acids will not. Notwithstanding such a test is only good to aid other tests, there are experts in the business who rely upon it to a great extent.

If, however, the combination of the three tests mentioned: the barium salt, the chloride of lime, and the taste, which all may be made in a few seconds, leave doubt, we may add the first step of the operation described on page 120, about which one of my critics says: "The evaporation of the vinegar to the consistency of an extract volatilizes all the acetic acid contained in it." If this be so we may stop there, as any acid left and indicated, by the usual test, must be the non-volatile sulphuric acid, except, perhaps, some traces of tartaric acid in wine vinegar, or malic acid in cider vinegar, which are easily neutralized by a single drop of liquid ammonia, which would be insufficient to neutralize the powerful sulphuric acid, except when this was only present in such small quantities as to amount to very little, even after the concentration. In order to be sure in regard to the removal of all the acetic acid, some alcohol may be added while the liquid is yet hot; this will, as I have stated, change the acetic acid, if any be present, into the more volatile acetic ether, which may then be driven off with the alcohol, when the removal of all traces of acetic acid is more certain.

I am aware that Fehlig, in his chemical dictionary, besides describing the iodide of starch test, brought forth in the last number of the SCIENTIFIC AMERICAN, describes also the test mentioned on page 120, but disposes of it in three lines, while on page 120 this is expanded into 15 lines, and some totally unnecessary details added; for instance, the acidulation with hydrochloric acid. This added complexity and elaboration prejudiced me against the whole operation; then from many samples of vinegar of different origin I have tested, none gave proof of adulteration with sulphuric acid and only one a slight indication of sulphates. I must confess that from these causes I attacked the prescription with more severity than it deserved.

The plan of Mr. Wilder to distil the vinegar and test the distillate with barium will fail, as the sulphuric acid is not volatile enough to go over with the acetic acid. It remains behind with the sulphates. P. H. VANDER WEYDE.

New York city.

The Dangers of Car Coupling.

To the Editor of the Scientific American:

One of the oldest and most respected men employed on the Michigan Central Railroad was killed, while coupling cars, on the 24th ult. I was at the depot yesterday, and met a shipping clerk checking cars, whose face was familiar. I enquired of him at what spot was the man killed a few days ago. He burst into tears and pointed with his hand at the place, and said, through his sobs: "It was my father. Oh! such a good father; there was no other like him. We never shall get over it. My mother, or any of us, cannot realize it yet. He left us at the breakfast table, in such good spirits. Before noon he was brought home, crushed but still living, and died amid terrible sufferings."

There is no railroad yard but kills or cripples a man now and then; in the yards of Kansas city four men were crushed last month. This city of Detroit has had as many victims of bad couplings within two months, and at that rate they would number thousands throughout the continent during a year. And it is our best young men who are thus sacrificed; they must be steady, faithful, active and strong. To the wrought iron draw bar, and to the false economy of railroad managers, belong most of these murders. Any one, who has to handle such couplings, reading this, will say: "Yes, confound the wrought iron draw bars. I don't see why they use them, any how." I ask now through your columns the opinion of master mechanics, yard masters, conductors and brakemen on the subject of wrought iron draw bars. The public will soon learn from them that those narrow mouthed and open back draw bars compel them to hold the link with their fingers till the cars almost touch each other, or the link will strike the edge of the opening and be pushed back in the open space; and the men would be compelled to move the train again to make the coupling. Consequently they run any risk to make the connection. Perhaps a Congressional committee could find a coupling in the Patent Office which would save life and not fill our streets with armless and crippled men. J. WHITEFORD.

Detroit, Mich.

An Improved Flooring.

To the Editor of the Scientific American:

In one of the late numbers of your admirable paper (the reading of which is a weekly source of pleasure to me), I perceive a notice of wooden carpeting, made by a company of your city. This induces me to explain a method I have adopted for summer use in my dining room:

I first had the floor made perfectly smooth and flat; then I stretched good strong cotton cloth ("domestic") all over the floor, and soaked it well with very hot strong glue. This completely fastened it to the floor. When perfectly hard and dry, I laid down, with paste, a good quality of wall paper (marble pattern), having both edges of the paper trimmed so as to make no ridges, and afterwards varnished with three coats of coach varnish, permitting each to dry thoroughly. By this means I have a solid floor, very beautiful in appearance, and, after six months' wear, quite as perfect as the first day it was used. Twelve years before the war, I had a room covered in this manner at the plantation; and in 1864, when the house was burned, the floor was still in a much better state of preservation than other rooms covered with oil cloth that had less wear. I have often thought, if thin wood of different kinds could be laid down in the same manner, that perfect floors could be made, quite as handsome as the inlaid floors I have seen in Europe, and at a very trifling cost, which, in the impoverished condition of our southern country, is a great *desideratum.*

Natchez, Miss. H. L. SELLERS.

A Hint to Chemists.

To the Editor of the Scientific American:

A few experiments with animals, similar to those that Salm-Hortsmar and others have made with plants, would be of great advantage to our knowlege of physiology.

By rearing animals on pure starch and gluten, with varying and known kinds of mineral substances, and then examining their bodies chemically to see that no other matter had obtained admittance, the essential elements of animal life might be determined.

By feeding animals for a long time on food with a very small proportion of a non-essential mineral substance added, and then examining, both chemically and microscopically, to ascertain to what extent the substance under experiment had accumulated, and whether it had substituted any other element, or existed as a foreign aggregation merely, some light might be thrown on the action of accumulated mineral poisons.

It is known that animals grow by digesting and decomposing vegetable products; on the contrary, it is also known that hogs fed on madder absorbed so much of it in an undecomposed state as to change their bones to a red color. By dosing animals with small quantities of vegetable acids, alkaloids, etc., and then testing their bodies, the question as to whether all vegetable substances may be decomposed by the

stomach, when presented in not too large quantities, might be answered.

I would suggest that rats, mice and guinea pigs would be cheap and convenient animals for experiment.

If any of the above experiments have already been made, doubtless many of the readers of the SCIENTIFIC AMERICAN would be glad to see an account of the particulars.

Charlotte, Me. H. A. S.

Iron Pins.

To the Editor of the Scientific American:

One of the abominations of this nineteenth century is making iron pins in place of brass ones, and making them, too, so that even careful housewives are imposed upon, until rusty clothing, bad points, and bad temper of both pins and owner betrays the swindle on peaceful unconscious humanity.

In vain good old-fashioned pins are called for and prices paid to fully cover the difference in value between brass and iron. To prevent the imposture, the writer hit upon a happy expedient, namely, testing them with a magnet; even the magnetized blade of a pocket knife is sufficient. If the least disposition is shown, in the innocent but truthful household implement, to hop towards the blade, refuse them at once and tell your dealer to get you some good old brass pins, and to "sin no more." NOVICE.

Medina, Ohio.

KNITTED GOODS AND THEIR MANUFACTURE.

The material used for making knitted garments, such as are employed for ordinary underwear is a mixture of cotton and wool. The industry is a growing one, and is largely carried on in New England and in certain portions of northeastern New York.

The wool is received in the bale, and is first cleansed. This process consists in scouring it in a hot solution which removes the grease and dirt, and then passing it through rollers which wring out the moisture. Drying follows, in summer by means of a blast of air, in winter by exposing the material in rooms heated to about 120°. The wool is then burred, sharp steel teeth separating its fibers, which afterwards pass into an enclosed case, where a current of air tosses them about until they become in a literally perfect fleecy condition. Indeed, it is difficult to recognize the pure white substance which leaves the burring machine as the coarse filthy matted masses which are first encountered on entering the factory. Meanwhile the cotton is also being cleaned and separated. Ingenious machines take it as it comes from the bales, pull it apart, remove its impurities, and finally leave it in a condition as soft and pure as its future companion, the wool. Now comes the mixing of the two ingredients, so to speak, which form the knit web. The proportions vary according to the articles made and the peculiar ideas of the manufacturer. Garments of this nature are seldom "all wool," although often sold under such representation. The mingling is done by pickers, steel points which work the two kinds of fiber intimately together, turning out the mass evenly incorporated throughout.

The material is now complete and ready to undergo the processes preliminary to weaving, or rather knitting. It first finds its way to a "lapper" or machine which detaches the fibers and then passes them to the outside of a wire gauze rotary cylinder, to which they are forced to adhere by means of a partial vacuum produced inside by rapidly revolving fans. On this cylinder, the fibers become slightly felted together so that the material is removed in the form of loosely made batting, and in this state is rolled upon large reels. In the next machine, a "double lapper," four rolls of this mixed wool and cotton batting are used at once, being made to "lap" over each other and to pass through rollers so that they finally emerge combined in the shape of a thick loose fabric.

Carding is the next process, the same machines being employed as are used in all cotton or other weaving mills. As this operation is doubtless familiar to almost every body, we shall not stop to describe it, but simply note the change which it produces in the material from a cloth or batting to the form of a soft thick rope. This, passing through another machine, emerges in shape of a cord resembling worsted. Then it is taken to the spinning apparatus and finally comes out a stout firmly made yarn, which, being wound upon bobbins, is ready for the knitting machines.

It is difficult without the aid of diagrams to convey to the reader an accurate idea of these last mentioned somewhat intricate pieces of mechanism. New improvements are constantly being made in their construction. Some manufacturers have special appliances of their own devising, which they reserve for use in their particular establishments; so that a description of any single machine would fail in many details to be applicable to all. There are some points, in common, however, to nearly every pattern, which may be generally cited. The needles resemble in form those used in making crochet work. They are arranged in a circle, the number used depending upon the fabric to be knit. The measure for their number, technically termed the "gage," is so many needles to three inches space on the circumference of the circle. Thus, a machine having 14 needles within the above limit is called of "14 gage" and makes a coarser material than one, for instance, of "18 gage." The strand of yarn passes around the circle and is brought under the hooks of the needles. The latter move up and down successively, while a suitable device holds each row of loops as it is formed until the next row is made. The fabric is thus knit in the form of a tube and passes upwards to a large roller, suspended above the machine around which it is tightly wound. From fifty to one hundred yards of finished knitting are thus daily produced.

The cloth is next washed and either hung in heated apartments to dry or else the moisture is removed by passing a current of hot air through its length, it being still in the tubular form in which it is finished.

From the laundry, the cloth passes to the hands of an army of women. Some, provided with huge shears, spread the material on long tables in layers of six or seven thicknesses, placing upon it wooden patterns and rapidly marking and cutting out garments. Others, seated before long tables on which are sewing machines driven by the power of the establishment, baste, sew, and finish, in a single manufactory, as many as 200 dozen underclothes per day.

The finished goods then pass to the packers, who fold them and press them in a powerful steam press. Next comes the sorting of sizes, packing in boxes, and, lastly, the labeling with trade mark, etc., when the garments are ready for the wholesale dealer.

SCIENTIFIC AND PRACTICAL INFORMATION.

PICKLES.

The following recipe for pickling cucumbers, etc., has been sent us by a valued correspondent, and will be generally acceptable at this season of the year: Wash the cucumbers clean. Place about a dozen leaves of a grape vine on the bottom of the pickling vessel (a barrel or stone jar will do). Pack a layer of cucumbers snugly on the leaves, and sprinkle over them a small handful of salt. Then lay vine leaves again, and then cucumbers and salt, and repeat the order till the vessel is nearly full. Cover over with vine leaves, and put a round board on the leaves with a clean stone on the top. Fill the vessel with water till the cucumbers are covered; the board will prevent them from swimming on the water and so becoming exposed to the air. Taste the liquid; it should be pleasantly salt; add a little salt if it is too flat. Let the whole stand, in a not too cool place, for three weeks, when the cucumbers will be sour and ready to eat. They will keep all the winter if put in a cool place. No vinegar is necessary. The pickles will be of an olive color, and are more wholesome than poisonous bright green sulphuric acid and brass kettle pickles sold in almost every store. The Germans use altogether the above recipe for pickles; but it is a fact that dentistry is more perfect in America than in Germany, and our correspondent does not wonder that the pickles here have done much to give that science its present perfection.

TO DETECT SULPHURIC ACID IN VINEGAR.

We have received so many letters on this subject that we are compelled to decline publishing many good methods which our correspondents have forwarded. The following, however, will give housekeepers, and others to whom chemical processes are not accessible, an opportunity of testing the purity of the article: F. S. G., of D. C., sends Fresenius' test, simplified for general purposes: Put a wine glassful of the vinegar into a china tea cup, and let the cup float in water in a pint cup of tin or other metal that will stand heat. Boil the water till half the vinegar has evaporated, then drop into the cup a piece of (cane) loaf sugar about the size of a grain of wheat. Continue the boiling till the liquid in the cup has evaporated, when, if the vinegar contains free sulphuric acid, the dry residue will be found to be blackened. The charring of the sugar is due to free sulphuric acid. The presence of sulphates does not affect this test.

E. C. H., of N. H., puts a clear solution of a few grains of sugar of lead with the vinegar; and he states that if the mixture remains transparent, the vinegar is pure, but sulphuric acid betrays itself by forming a milky precipitate.

New Method of Printing on Cloth.

Mr. E. Vial, of France, proposes to first impregnate the tissues to be printed with a solution of nitrate of silver, or of some other metallic salt, which, when brought into contact with zinc or copper, will be reduced to the metallic state. His design is in this way to print upon the impregnated tissue with a zinc (or copper) pattern. The result of this process, is that, wherever contact is made between the metal plate and the cloth, there is formed a metallic precipitate of silver (if the nitrate of silver was used to saturate the tissue) which is firmly fixed upon it. The color of the precipitated metal may be varied, according to the strength of solution used, from a brilliant grey to a deep black. The color is declared to be very fast, withstanding acids, alkalies or soaps.

A New American Steamer.

The citizens of Philadelphia, represented by the American Steamship Company, are determined to have a first class steamer line of their own, to run between that city and Liverpool. The first vessel of the new line, named the *Pennsylvania*, was lately landed at Philadelphia with much success. She is a large and splendid vessel. Length, 355 feet; beam, 43 feet; depth, 33 feet 6 inches; capacity, 3,854 tuns; draft, 20 feet 6 inches. Is to have accommodations for a thousand passengers, is to run 11½ knots per hour on 40 tuns of coal per day. We heartily wish for the success of this new enterprise.

PROFESSOR KING and Mr. Schaeffer made a balloon ascension from Rochester, N. Y., on September 3, went up 6,000 feet, staid up an hour and twenty minutes, and then landed at East Bloomfield, twenty miles distant, we believe, from Rochester.

PROFESSOR De Volson Wood of the University of Michigan has accepted the professorship of mathematics in the Stevens Institute of Technology, Hoboken, N. J. Professor Wood is one of the most able and distinguished mathematicians in the country.

The Whistling Lantern—A New Safety Lamp for Miners.

Dr. A. K. Irvine, Glasgow, lately read before the Iron and Steel Institute a paper on "A new safety lamp for miners, for indicating by sound the presence of explosive mixture of gas and air, based on a new form of singing flame and on a fog horn on the same principle." In the course of his paper, Dr. Irvine stated that, when a mixture of any inflammable gas or vapor with air in explosive proportions passes through and is ignited upon the surface of a disk of wire gauze of such mesh as to prevent the passage of flame, and a suitable tube or chimney is placed above, and surrounds at its lowest end, the disk, preventing admission to the chimney except through the wire gauze, a musical sound is produced, varying in pitch, etc., with the size of flame and dimensions of the chimney. In this, as in other flames singing in tubes, the sound is caused by the vibration of the flame determined or intensified by the current up the chimney, and communicated to the column of air or gaseous fluid within the chimney, whose length commands and times the rapidity of the vibrations so as to produce a given note, just as the flutter of the air originating at the *embouchure* of an organ pipe is commanded by the length of the pipe. The conditions under which this flame is produced differ considerably, from those of other singing flames. The hydrogen jet, for instance, is burned in an open tube, to which air is freely admitted at the lower end, and it is necessary that the tube enclosing the jet should be lowered more or less till the singing point is found. In Irvine's singing flame the tube is not open at the bottom, and no admission takes place except through the wire gauze, and the note is produced when the flame is at the lower extremity of the tube or chimney. The fact of the combustion of an explosive compound on the surface of a material impervious to flame (namely, wire gauze, originally employed by Sir Humphrey Davy in the construction of safety lamps) suggested the possibility of employing this flame for the purpose of giving warning by sound of the presence of an explosive atmosphere, or elsewhere, by means of a lamp suitably constructed. Accordingly, Dr. Irvine said he had had lamps made for giving light, which, while the atmosphere is not contaminated by fire damp or other inflammable gas, burn in the usual way, but which, as soon as such a gas mixed with air in explosive proportions enters it, appeals to the ear by a loud musical sound, as well as to the eye by its effects on the appearance of the flame in the lamp—just as is in the Davy. In one form of the lamp, which is more particularly adapted for the use of the viewer, the air is made to enter near the top of the lamp, obviating the necessity of turning the lamp on its side, as is frequently necessary with the Davy when but a thin layer of the fire damp is floating at the ceiling of the mine. In another form the lamp is adapted to the use of the working miner, and a superior light is obtained by the use of paraffin oil. In a third form, specially constructed with the object of being a warning apparatus as well as a stationary light, the sound is given forth when an atmosphere of gas and air under the explosive point enters it. Another application of this singing flame was its use as a fog horn, which, on account of its portability, simplicity, and cheapness, might take the place of a costly apparatus, and would be highly suitable for railway junctions or other situations of danger. All the above apparatus were made to sound during the reading of the paper, and elicited much applause.

An Electrical Fire.

A fire recently broke out in the flooring of one of the offices of the Western Union Telegraph Company in this city, which was found to have originated in a cable of cotton covered wire saturated with paraffin, through which the lines entered the office beneath the floor. From some cause, probably lightning, a connection had been formed between two through wires attached to large main batteries at the general office, and which were connected with opposite poles to the ground. Two large batteries were thus connected and thrown into short circuit, developing an intense heat and setting fire to the inflammable paraffin covering of the wire. If this singular occurrence had happened after the closing of the office at night, it might have resulted in the destruction of the building, and the cause of the fire would have remained a mystery. Of course an accident of this kind could hardly have been foreseen, but it serves to point out the necessity of caution in running wires under the peculiar conditions described.

ROMANCE OF THE TELEGRAPH.—A telegraph clerk of London, who was engaged on a wire to Berlin, formed an acquaintance with and an attachment for a female clerk, who worked on the same wire in Berlin. He made proposals of marriage to her, and she accepted him without having seen him. They were married, and the marriage resulting from their electric affinities is supposed to have turned out as well as those in which the senses are more apparently concerned. These young clerks, however, were not very rash, nor did they marry without due acquaintance with each other, as many prudent persons might suppose—for, according to Mr. Scudamore, a clerk at one end of the wire can readily tell, by the way in which a clerk at the other does his work, "whether he is passionate or sulky, cheerful or dull, sanguine or phlegmatic, ill natured or good natured."

THERE are now in daily use on the Michigan Central Railroad fifty one cars fitted up expressly for carrying butter, beef and eggs from Chicago to Boston and New York. An average of four of these cars start east each day, and are inspected and re-iced at Detroit before they go further. Each car consumes four tuns of ice on the trip

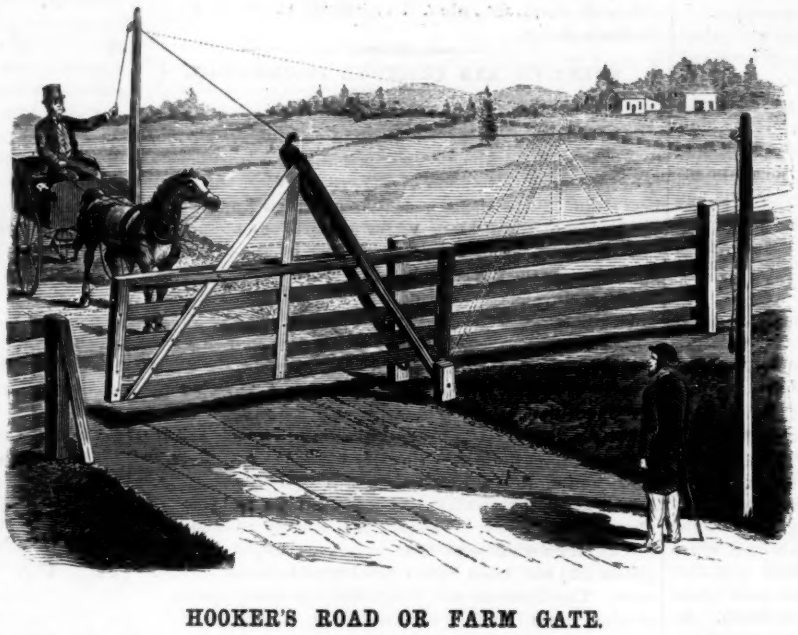
IMPROVED ROAD OR FARM GATE.

The object of the invention shown in our illustration is to afford a means of opening and shutting gates without requiring the occupant of the vehicle passing through to descend for the purpose. The device is at once simple and effective, and but few words of description, added to its graphic delineation in the engraving, are needed for its explanation.

The gate is constructed, as shown, in a firm and substantial manner of any suitable material, and is freely suspended by means of a pivot passing through the extremities of the three braces represented as extending from the lower corners and from the center of the bottom rail, between two swinging posts. The upper extremities of the latter are connected together while the lower ends are arranged to pivot readily on the solid blocks of wood or stone set in the ground. The highest bar of the gate, it will be noticed, is prolonged, and passes loosely through a slot cut in the upper part of one of the adjoining fence posts. To the ends of the two uprights by the road side, one of which is represented in the foreground and the other beside the wagon, single pulleys are suitably attached, while at the top of the swinging posts which support the gate, a similar pulley is fastened. A rope passes through all three of these pulleys, its ends hanging beside the uprights.

The method of working this apparatus is as follows: The gate being closed, the driver of the vehicle pulls upon the rope, which extends down to a convenient distance from the pulley on the upright beside him. The other extremity of the line being stopped by means of a knot cast in it, the strain is brought to bear upon the swinging posts of the gate. These, moving freely on their lower pivoted extremities, are lifted from a diagonal to a vertical position, and then, swinging pass their center, fall as shown by the dotted lines in the engraving. The gate, which is guided by the prolonged bar before referred to, is bodily lifted, and its upper left hand corner describes the arc of a circle which, dotted in the illustration, it is represented as beginning to traverse. At the end of its movement, the gate is found to have been transported sideways clear of the road, and to rest beside and parallel to the fence. The position of its parts and the direction which the rope assumes are clearly represented by the dotted outlines. After passing through, it is only necessary for the driver to repeat the foregoing operation, pulling on the other extremity of the rope, when the gate returns to its former position and is closed. By the use of a balance weight, the gate may be easily lifted.

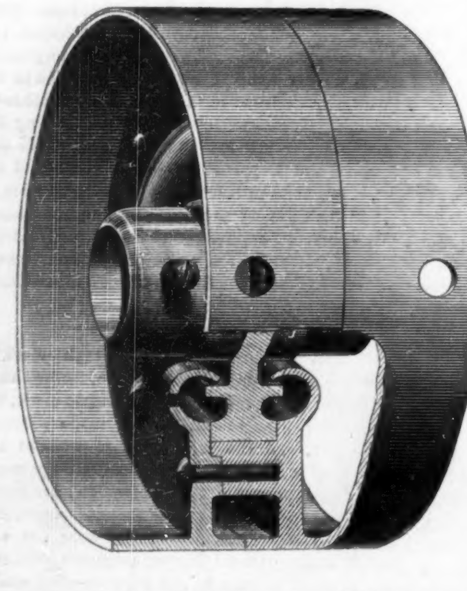
This device has been successfully employed in several of the Western States for some three years past. Further particulars concerning it may be obtained by addressing W. C. Hooker, Abingdon, Ill.



HOOKER'S ROAD OR FARM GATE.

GROSVENOR'S SELF-LUBRICATING LOOSE PULLEY.

The self-lubricating loose pulley which forms the subject of the present article was patented April 9, 1872, by Mr. J. P. Grosvenor, of Lowell, Mass., some of whose previous inventions in this and other directions have been already illustrated and noticed in the SCIENTIFIC AMERICAN.



Our engraving represents the pulley, which has part of the face broken away to show a detail section of the working parts. It is composed of a hub and disk, which are made fast to the shaft by set screws, one of which is shown in the engraving. The pulley is made in two parts, as represented, and it revolves on the outer circumference of the disk. The parts are fitted together by an oil-tight joint, and are secured to each other by set screws, by which construction the disk is introduced within the pulley, to the interior of which it is fitted on its rim. The oil chamber is annular and runs entirely round the sides of the disk. It is formed by curving the sides of the pulley outward, and then around and within the annular projections shown on each side of the disk. The chamber is supplied with oil by removing the set screw shown in one side of it.

As the pulley revolves upon the disk, every part of its bearing surface passes through the oil at each revolution, and at the same time the peculiar form of the sides of the oil chamber and the disk prevents any oil escaping while it is being carried round the top of the pulley by dripping down, for it is carried round to the lower side. It may be taken off the shaft and carried in any position without the oil escaping.

It will be seen that this pulley is constructed upon a novel principle, the oil chamber being placed within the circumference of the bearing upon which the pulley revolves. This insures the constant lubrication of all the parts by reason of the centrifugal force developed by its revolution; and it is stated that in consequence thereof there is hardly any wear in the pulley or its bearings. The inventor says these loose pulleys have been run at the rate of one thousand revolutions per minute for eight weeks without re-oiling and without escape of oil, and sufficient oil was then left in the chamber for a longer run.

Further information may be obtained of the patentee and manufacturer at the address stated above.

Catching Shad with Hook and Line.

Mr. Thomas Chalmers, after repeated experiments, has succeeded in devising a bait by which he has been enabled to hook shad without difficulty. He says: A careful examination of the stomach of the shad gave no light as to what they fed upon. Various kinds of bait, natural and artificial, were tried, and for a considerable time without satisfactory result. At length some flies were dressed in a peculiar manner, and these the shad took and were captured in considerable numbers with hook and line. In July, 1871, 168 shad were taken on two poles. Three flies were used on one line, and sometimes as many as three shad were taken at one cast—the whole weighing eight and a half pounds. The present season has not been so good, owing partly to roily water, but the sport has been fair. In one evening, between 7 and 8:30, himself and a companion took in twenty shad on hooks and lines. Mr. Chalmers says that from boyhood he has been given to sport with rod and line, and thinks the catching of shad with hook and line the best angling he has found. He desires that this method of shad fishing be tried in other waters than the Connecticut. His experiments were made in that river, at Holyoke, Mass.

New Route between New York and Boston.

A new route for travel has just been opened between New York and Boston. Passengers take the cars at Brooklyn, N. Y., and ride to the east end of Long Island at Greenport, ninety miles, where they go on board a steamer and sail thirty miles, across Long Island Sound, to New London, Conn., thence by rail over the Northern and Boston, Hartford and Erie roads, one hundred and twenty-six miles, to Boston. Time, nine hours—about the same as the other routes. This Long Island route was operated some years ago, but, not proving profitable, was abandoned.

The Adaptation of Electricity and the Telegraph to General Use.

The telegraph and electricity are yearly entering more and more intimately into the daily service and convenience of the people. It sounds the alarm and brings speedy succor when fire threatens devastation and ruin. It furnishes to every merchant, broker, and business man who desires it, in the more important business centers, a constant record in his own office or counting room of the condition and transactions of our exchange, and the quotations of leading articles of traffic and commerce. It calls messengers and assistants, when needed, to any locality, at all hours of the day and night. It furnishes communication between the offices, manufactories, and places of business of merchants, manufacturers, shippers, and others. The editors of our great newspapers can sit in their libraries at home and direct, by means of telegraphs, easily operated by themselves or members of their families, the management of their papers. The liability to danger and destruction on railroads is greatly lessened, and disasters averted, through the use of electrical signals. The engineer, as his locomotive dashes along the iron rail at a speed which outstrips the wind, can, at a glance at the signal by the road side, know the condition of the line for miles ahead, and whether other trains are likely to be encountered, or misplaced switches and open drawbridges invite him to death and destruction. Our bells are rung by electricity, our clocks are regulated by the electrical current, the fidelity of watchmen is assured or their lack of vigilance recorded with unfailing accuracy by the electrical tell-tale. The concealed wire and electric circuit betray the operations of the burglar and thief, and our gas is lighted by electricity.

The uses to which the electric current and the telegraph have been and shall yet be adapted are so numerous even now as to surpass our comprehension. It is the mightiest agency of modern times, the true wizard's wand, which manipulates and controls the affairs of mankind.

In the science and administration of this mighty agency, many thousands of people are constantly engaged, and their number is yearly and almost daily augmented. They constitute a large community, and upon their intelligence, capacity, and fidelity the most momentous and important interests constantly depend.

It is impossible even now to predict what advances and discoveries may yet be made in electrical science and telegraphy. Astonishing as these have already been, there is undoubtedly much yet to be learned, and new adaptations will continue to be made; and those who would profit by them professionally must be diligent and persevering in their studies and efforts to acquire and maintain an advanced state of knowledge and information. In science and art, there is no royal road to success.—*The Telegrapher.*

WHEEL AND ROLLER SASH CATCH.

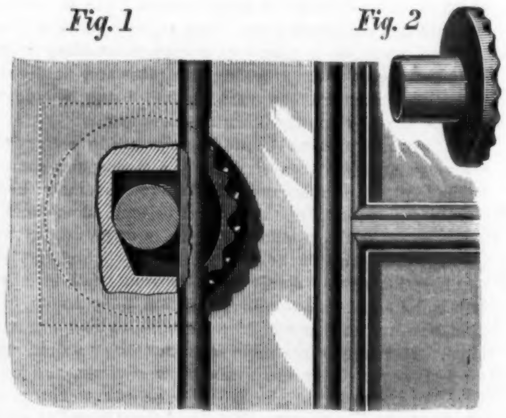
The sash catch herewith illustrated is a most simple contrivance, and apparently of a very effective character. It consists simply of a wheel and roller cast in one piece, and is fixed in position to do duty very readily.

Fig. 1 shows the catch applied to the frame and sash, and Fig. 2 gives a perspective view of the wheel roller.

A is the sash, B the window frame, and C the covering strip. In order to insert the catch, the wedge-shaped hole exposed in the frame is cut to receive the roller, and a mortise is also framed for the reception of part of the wheel, while a recess is formed on the under side of the covering strip for the remainder of the latter to pass through. The roller and wheel are placed in the excavation made for them, and the covering strip is attached, when the parts occupy the position represented in Fig. 1, where the situation of the covered part of the wheel and the mortise are indicated by dotted lines. For the better understanding of the foregoing, the reader will bear in mind that, in our engraving, parts of the frame and covering strip, together with such part of the wheel as would be otherwise disclosed by their removal, are broken away in order to show the shape of the recess and the position of the roller therein.

The operation is as follows: The tendency of the roller is to press downward, into the wedge-shaped cavity formed by the frame and the juxtaposed sash, by its own weight, and when a very slight partial rotation is caused in it by the friction of the descending sash, this tendency is so much augmented as to instantly wedge it tightly therein, and thereby secure the sash at whatever altitude it may happen to be. To release the sash, all that is necessary is to push up the projecting edge of the wheel, which is very easily done, as it is

Fig. 1 Fig. 2



sufficiently roughened to be readily rotated by the fingers. The window stops instantly at whatever point it is pushed up to, and is so firmly wedged there as to prevent rattling of the sash, should the same be loosely fitted.

The catches are said to answer well for weights of house sashes; they are not liable to break or to get out of order, do not mar the sash, and are furnished very cheap.

The device was patented July 23, 1872, and further information in regard thereto may be obtained of the inventor, T. McDonough, Montclair, N. J.

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Contents:

(Illustrated articles are marked with an asterisk.)

SERIOUS MARINE DISASTERS.---IMPROVED SAFETY APPLIANCES GREATLY NEEDED.

A fearful record of loss, both of property and life, has filled the columns of the daily press during the past week. The somber category shows four fine vessels of our merchant marine totally wrecked and scores of human lives sacrificed.

The propeller Metis, plying between New York and Providence, on the morning of the 29th of August last, while in Long Island Sound, five miles off Watch Hill, Rhode Island, came in collision with a coasting schooner and speedily sank. As the ship sank, her spar deck was lifted bodily clear of the hull, and remained on the water a floating raft, thus saving many passengers who would otherwise have perished. As it was, some forty lives were lost.

The Metis was constructed with three compartments formed by bulkheads placed athwart her hold. It is stated that she had just been thoroughly refitted, and was to all intents a new vessel. How "thoroughly" this work was done is amply evidenced by the fact that two compartments, which should have remained intact and floated the vessel, even if the third had filled, must have given way—the bulkheads bursting in—so that they were no protection whatever.

There is no subject which calls for peremptory legislation more than the proper construction of the hulls of vessels. The compartment system should be made obligatory in every passenger ship, and the spaces divided off should be actually, not theoretically, watertight, and totally distinct from each other. Cases are numerous where the safety of vessels has been solely due to this method of construction. The collision off Newfoundland, resulting in the sinking of the ill fated Arctic, injured the propeller which she struck only to the extent of breaking in a portion of one of her compartments, which did not prevent her from making the nearest port in safety. The Great Eastern, built with a double skin and amply strong compartments, struck on a rock, during her passage through Long Island Sound, tearing open the plates of her bottom for a length of some twenty feet, and yet no difficulty was experienced in keeping her afloat. On the other hand, the terrible calamity of the United States frigate Oneida, which had no compartments, and consequently foundered a few minutes after being injured, is yet fresh in the public mind. In our own experience, we have seen one of the largest and most powerful steam frigates in the navy compelled to bring by the wind, shift all her guns and heavy weights, and range all her crew to leeward, in order to heel her over sufficiently to raise the outboard delivery opening, which is below the water line, out of water. Some of the valve gear had been carried away, and a stream of water twenty inches in diameter had already risen above the fire room floor and menaced the fires. Luckily the weather was calm and the sea smooth, as otherwise the difficulty in stopping the leak would have rendered the ship in imminent danger. Had she been properly constructed, a single compartment would have filled and there the mischief would have ended.

The great corporations owning lines of steamers, though lavish in expenditure for elaborate upholstery and gorgeous decorations, with strange inconsistency are parsimonious in the extreme in matters of the most vital importance regarding the safety of their vessels and passengers.

The cases of the side wheel steamer Bienville, of the Pacific Mail Company, which was burned at sea on her passage from New York to Aspinwall on the 5th of August, also of the America, another large steamer belonging to the same company, burned at Yokohama, Japan, August 24, and that of the propeller Nevada, consumed by fire in New London harbor on the 31st of the same month, are similar in many respects. Both doubtless owe their loss to spontaneous combustion taking place in their cargoes. The Bienville, though fitted with steam pumps and other fire extinguishing apparatus, found in the hour of danger that they were useless.

Complete immunity from the dangers of marine conflagrations we hardly expect. As if in mockery of man's best efforts, the news comes to us from Yokohama (Japan) of the burning of the magnificent steamer America, belonging to the Pacific Mail Line, and one of the largest side wheel vessels in the world, in the harbor of that city. She contained every improved appliance, and her fire regulations were supposed to be nearly perfect. She arrived at Yokohama on the morning of August 24, and at 11 o'clock on the same night the freight deck took fire, and immediately the whole ship was enveloped in flames, defying all efforts to extinguish them. The vessel was totally destroyed, together with the mails, freight, and the luggage of the passengers and officers. The rapid progress made by the fire forced all hands to jump into the water, there not being time even to lower the boats. The America measured 4,454 tuns, hull of live oak, divided into compartments by means of three bulkheads. Her engine was 2,230 horse power, steam cylinder 105 inches in diameter, piston stroke 12 feet, wheels 42 feet diameter, 12 feet face; four boilers, each having six furnaces.

For use, in case of fire or leakage, the vessel is said to have been provided with an independent boiler and pump upon each deck, throwing from seven to ten streams, besides other devices for extinguishing fire.

There seems to be no really valuable system for extinguishing fire aboard ship. Even closing all hatches and ports does not render the hull airtight, and unless it is very nearly so, jets of steam or of gas from extinguishers are of little avail. A mode of completely flooding a vessel is needed, and the subject is worthy of the attention of inventors. We published, a short time since, a valuable method of laying pipes through factories and other large buildings, by means of which the most spacious apartment can be completely drenched in a few seconds. Repeated tests have proved the efficiency of this system, which may be easily modified for vessels. We are of opinion that owners should be compelled to locate pipes through which water might be forced into every part of the cargo without breaking bulk, and more especially should this be insisted upon in cases where, like that of the Nevada, the vessel is loaded with dangerous materials.

CAR COUPLING DANGERS.

We publish in another column the letter of an esteemed correspondent, who complains very strongly against the railway companies for their neglect in not supplying proper means or enforcing proper regulations for the coupling of their cars. It is undoubtedly true, as he states, that many lives are annually lost, and many families reduced to bitter distress in consequence of this neglect.

How to remedy the matter in an effectual manner appears to be a question somewhat difficult of solution.

The common method of coupling is by means of an open link, each end of which is secured in the end of the platform buffer or drawhead by means of an iron pin. In the act of coupling, it is common for the brakeman to stand between the two cars that are to be connected, for the purpose of holding up and guiding the link into the mouth of the opposite buffer; the engineer now backs the train, and, as the cars approach, the brakeman directs the link with one hand and with the other drops in the pin when the link has reached its place in the buffer. This is a quick and simple operation, and would not be especially dangerous if the track were always level, the cars all of uniform weight, and engineers always careful and dextrous in the management of their locomotives. But such is not the case, and the cars are sometimes brought together with such rapidity and force that the poor brakeman is crushed before he can jump out from between them.

Of all people in the world, railway operatives are the most reckless in regard to their lives, which they do not hesitate to hazard for the purpose of saving themselves the slightest trouble. This matter of car coupling is an example. We believe it to be entirely unnecessary for the brakeman to stand between the cars in the act of coupling. He may stand upon the platform and, by the use of a loop of twine or a crooked stick, hold up and direct the link into its proper place, and so avoid all danger to his person. But this precaution is attended with the trouble of climbing to the car platform, providing the string, keeping it always in readiness, etc. Rather than do this, he recklessly places himself between the cars, and runs the terrible risk of his life.

Multitudes of self acting car couplers have been invented, and some of them have been brought into use. But the link and pin is so simple, so well adapted to cars of varying hights and sizes, so easily renewed when broken, so quick, effective and safe if properly treated, that their displacement by a more expensive or complicated device is difficult, if not impossible.

We should be glad to receive the views of other correspondents upon the subject, especially of practical railway men.

AN AUCTION SALE OF MODELS AT THE PATENT OFFICE.

For the past few years the Commissioner of Patents has been puzzled to know what to do with the great number of models of rejected applications which have accumulated during more than thirty years, and occupying, as they have done until the past year, the whole of the west wing of the model room in the Patent Office. But an act of Congress, approved July 8, 1872, solved the problem, by authorizing the Commissioner of Patents to restore to the respective applicants such of the models, belonging to applications that have been finally rejected for one year, as he should not think proper to be preserved, or to sell or otherwise dispose of them as he might think proper. In considering in what way he could dispose of these models, he conceived the idea of using them to educate the youth in the different institutions of learning throughout the country, and accordingly, by an Associated Press dispatch, made known the fact that such institutions of learning as desired the models could have them, subject to a stipulation that they were to be preserved in good condition and returned to the Office upon the order of the Commissioner. This was a little more than a year ago, since when some seventy institutions have availed themselves of the privilege afforded of getting these models, and have received in all upwards of seventy thousand of them. Each institution sent a representative, who selected such of the models as he thought proper, and of these was made a list, which is preserved by the Commissioner, so that, in the event of any of the models that have been given out being required, the Office can obtain them. Of the models not wanted by any institution, there were some thousands, mostly in a broken and dilapidated condition; and these were a few days since sold at auction, in accordance with an advertisement which had appeared in the papers for a month previously. On the day of sale, the models and fragments were heaped together in sixty lots on the floor of the west hall of the Patent Office building, and the sale of them realized to the Office between seven and eight hundred dollars only, the prices varying from five dollars to one hundred and twenty-five dollars per lot. One lot of lamps sold for forty dollars to a gentleman, to be taken to Chicago; and another, a lot of sewing machines, some sixty in number, together with a quantity of odds and ends of sewing machine attachments, brought sixty dollars.

THE CINCINNATI INDUSTRIAL EXPOSITION.

The third Industrial Exposition in Cincinnati opened on September 3, and, we are informed, will surpass anything of the kind ever before held in that city. The buildings devoted to the fair have been greatly enlarged, until at present nearly four acres of ground are under roof, while altogether there are seven acres of exhibiting space. The exhibitors this year at present number 1,500, with 4,000 entries.

The premium list for this year is especially attractive. There are ninety medals of gold, three hundred and ten of silver, and three hundred and seventy of bronze, the whole costing some $12,000. The interior of the main hall is beautifully decorated, while the floral hall contains three miles of evergreens. The latter covers 21,000 square feet of ground space, and is surmounted by a roof containing 12,000 feet of glass. A superb display of rare and exotic plants, rustic work and ornamental gardening is to be exhibited. In the natural history department, which is not yet completed, innumerable fossils, skeletons and shells are being arranged. The power hall is not large enough, as it covers only about two thirds of an acre. Machinery of all descriptions will be represented. Fifteen engines are now in position, most of them running. Altogether over three hundred machines will be actually worked by steam power, the conditions of their exhibition being such that they will not be allowed to remain at rest. Wood working machinery, it is stated, will preponderate. The art hall contains five hundred oil paintings, contributed by citizens, many of which are by celebrated masters. Besides oil paintings, there will be a large display of water colors, engravings and photographs.

This exposition will be one of the largest ever held in this country and is especially remarkable as contrasted with its predecessors, which, though of much interest, were of no great magnitude. The railroads, extending in all over some 15,000 miles, communicating with Cincinnati have made liberal half fare arrangements, to continue during the fair, and the hotels of the city are making every preparation for the reception of the expected throng of visitors.

MEETING OF THE BRITISH ASSOCIATION.---ADDRESS BY A NEW YORK HERALD REPORTER.---LIVINGSTONE IN AFRICA.

The British Association met this year at Brighton, August 14, and on the next day Dr. Carpenter, the newly elected President, delivered his inaugural oration. But the great feature of a following meeting was the address of Mr. Henry M. Stanley, a correspondent of the New York *Herald*, who has suddenly achieved fame, if not fortune, by a successful adventure in Africa in search of the famous traveller, Dr. Livingstone. The Doctor had not been heard from for nearly three years, and much anxiety was felt in England in regard to his safety. The public interest in his behalf reached such a pitch that the Government finally organized an expedition for a search after the missing explorer, while a voluntary contribution for supplies and other assistance, amounting to some $25,000, was gathered. The starting point for these relief expeditions was Zanzibar, a well known settlement and steam packet post on the east coast of Africa, six degrees south of the equator. On this parallel, the width of the African continent, from the Indian ocean to the Atlantic, is only about eighteen hundred miles. The headquarters of Livingstone were known to be somewhere in the vicinity of a collection of native huts, designated as Ujiji, on the banks of a great lake, discovered by previous travellers, and called Lake Tanganyika. The route from Zanzibar to Ujiji is well known, distance about seven hundred miles, the first four hundred of which are very difficult to pass on account of the marshy nature of the ground and the extreme warmth of the climate.

The newspaper discussions, preparations and movements connected with the sending of the relief expedition excited

much interest in Great Britain, and it occurred to Mr. James Gordon Bennett, proprietor of the New York *Herald*, who was in England at this time, that it would not be a bad idea to dispatch one of his reporters to Zanzibar, and if possible send him on ahead of the relief party to interview Dr. Livingstone, and bring back news of the celebrated traveller in advance of other newspapers. No sooner thought of than done. A reporter was selected in the person of a young American rover, named Henry M. Stanley, who at once started for Zanzibar, where he engaged guides and men to accompany him, and then pushed on through the forest for Ujiji, which place they reached after some difficulties, and here they found Dr. Livingstone, waiting for long expected supplies.

The reporter was enabled to relieve the Doctor's immediate necessities; and after procuring from him letters giving an outline of his discoveries, with messages for friends at home, the enterprising Stanley posted back to the sea coast, then on to England with the great news, first directing further supplies to be sent from Zanzibar to Dr. Livingstone, who will proceed with his explorations. Stanley's recent arrival in England produced, as might have been expected, an immense sensation. His pluck in walking six hundred miles through the woods and mires, under a broiling sun, to interview Livingstone, and the enterprise of the New York *Herald* in sending him, have formed the subject of many columns of laudation in the various British papers.

At the meeting of the British Association, Mr. Stanley, by special invitation, gave an account of his African march before a very large and distinguished audience, composed of the members of the Association and their invited guests, among whom the nobility were strongly represented. The Ex-Emperor Napoleon, Eugénie and son were among the most interested auditors.

In the discussion which followed, some of the geographers pointed out the improbability of certain deductions made by Livingstone in respect to the sources of the Nile, while other places, reported by Stanley as the discoveries of Livingstone, were declared to have been visited by other travellers, among them Dr. Schweinfurth, the celebrated German *savant*. One of the reports says that Stanley "did not content himself with refuting Dr. Beke or Sir Henry Rawlinson; he abused them in a rhetorical way for differing from his friend Dr. Livingstone. Every one was glad to see the brave and absent and ancient explorer have so stout a champion present at the meeting. The Doctor must have charmed and inspired Stanley, or Stanley, with the generous heroism of youth and sympathy for common danger and suffering, resolutely liked the Doctor, and took his part against all adversaries and critics. Sometimes he answered by a dramatic grimace alone, and anon by a thundering denunciation of those who sat at home and criticized maps to contradict those who, by travel and peril and patience, have penetrated the dangerous lands and seen for themselves. When he referred to Schweinfurth, he exclaimed, 'I never heard the name of that German Doctor before. Ladies and gentlemen, there never was an Englishman who discovered anything, lake or land, river or mountain, or went anywhere, but immediately arises some red haired German and says he has been there before.' This thrust at the Germans delighted the Imperial party beyond measure. The Emperor shook with merriment. The Empress contrived to understand it, and for the first time was convulsed with laughter, in which her son also joined."

From the letters brought home by Stanley from Dr. Livingstone, it appears that he has been principally engaged during the past three years in tracing out the watershed of the Nile, and thinks that he has now nearly finished the business. He has discovered some very remarkable regions, full of great fountains, streams, and lakes. "I have ascertained," he says, "that the watershed of the Nile is a broad upland, between 10° and 12° south latitude, and from 4,000 to 5,000 feet above the level of the sea. Mountains stand on it at various points, which, though not apparently very high, are between 6,000 and 7,000 feet of actual altitude. The watershed is over 700 miles in length from east to west. The springs that rise on it are almost innumerable."

THE OPENING OF THE AMERICAN INSTITUTE FAIR.

The forty-first Annual Exposition of the American Institute was formally opened at the building of the association on the corner of 63d street and Third avenue, in this city, on the morning of the 4th ultimo. The exercises consisted of music by the orchestra, and an address delivered by Hon. F. A. P. Barnard, the President of the Institute, in which the prominent position and rapid progress of the United States in industrial matters, and the value of the efforts of the American Institute in forwarding and fostering native talent, were especially dwelt upon. The speaker considered that the productive power of manufacturing industry has more than doubled since the foundation of the Institute, and has increased tenfold since the Declaration of Independence. The relation of the industrial arts to civilization, the progress of modern industry, and the influence of science upon improvements, were learnedly discussed. In speaking on the last mentioned topic, the latest discoveries and inventions in dyeing, weaving, printing, ice making, explosives, intercommunication, and transportation were cited as examples. An earnest advocacy of international exhibitions in general, and an appeal in behalf of the coming Vienna Exposition in particular, concluded the oration.

As is usual on every opening day, the internal arrangements of the building were in a state of disorganization, and workmen were still busy in the different departments, completing the alterations necessary to accommodate the increased demands for space. Very few articles were in position, though exhibitors are now sending and arranging their goods with all possible dispatch. The applications for space, we learn, are more numerous than ever before, so that the Exposition bids fair to be far superior to that of last year. The managers are using every endeavor to finish the preparations for the reception of visitors, and they state that everything will be in place in a few days.

The department of engines and machinery, at the time of writing, is quite unprepared. All the boilers but two have been placed, and most of the shafting has been hung. We notice a rotary engine and a portable saw mill among the novelties. In the large hall, a vast variety of articles is present, which, in their present confused condition, it is impossible to particularize. In the art gallery, an elaborate display of photographs, drawings, etc., is expected. The department of the dwelling, which is rather more advanced than the other portions of the fair, contains several unique improvements in household furniture and appliances, which we shall notice in detail hereafter. In the center of the main floor is a huge soda water fountain surmounted by a colossal statue, which will doubtless prove an object of considerable attraction. The interior of the building is quite tastefully decorated, and will be brilliantly illuminated.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The twenty-first session of the American Association for the Advancement of Science has recently been held at Dubuque, Iowa. Several of our most eminent scientists were unfortunately absent, so that, as compared with those of last year, the transactions of the meeting present much fewer points of interest.

We regret to notice that the proceedings were not conducted with that gravity and dignity which we might expect from a learned body strictly devoted to the investigation of scientific subjects. The much vexed subject of temperance and the political discussion, into which the resolutions relative to the disposition of the Chinese indemnity fund seem to have drifted, were entirely out of the province of the meeting, and have only served as a text for the inane ridicule in which certain of our daily journals seem to revel, whenever they perceive anything at all extraordinary in the, to them, incomprehensible proceedings of scientific associations.

The session terminated with the usual excursions of the members to the interesting localities in the vicinity of Dubuque. The place of meeting next year, on the third Wednesday of August, will be Portland, Me. The officers elected for 1873 are Professor Joseph Lovering, of Harvard University, President; Professor A. H. Worthen, State Geologist of Illinois, Vice President; Professor F. W. Putnam, of Salem, Mass., Permanent Secretary; Professor C. A. White, General Secretary, and W. S. Vaux of Philadelphia, Treasurer.

We shall give from time to time brief condensations of the most interesting and valuable of the papers read.

A NEW SPECIES OF FOSSIL ELEPHANT.

J. W. Foster, LL. D., of Chicago, pronounces a fossil tooth, which has been found near Terre Haute, Indiana, to be that of an elephant, but of a particular species of the animal which differs specifically from any yet discovered. He states that not only is the tooth admirably adapted to the three fold work of crushing, grinding, and triturating the food as it passes in the various stages of mastication through the mouth, but that there seem to be high ridges of enamel and deep valleys of cement in it, which lend peculiar efficiency to its work, the arrangement of the teeth and jaws being like a curiously devised hopper with an upper and a nether millstone, in which the coarsest fibrous materials could be reduced to a pulpy mass. The characteristics of the teeth of all known species of elephants, fossil or surviving, brought into comparison with the tooth in question, exhibit striking differences—which are held to be sufficient to constitute the new species of *Elephas Mississippiensis*, whose hight did not probably exceed six feet, being diminutive in comparison with the gigantic *Elephas Primigenius*; but nevertheless equally a mammal of the post-pliocene epoch, deserving of the closest study by American palæontologists.

POSITIONS FOR ASTRONOMICAL OBSERVATIONS.

Astronomical observations should be made from high elevations. Professor Young reports the whole number of lines in the chromosphere seen from Sherman, a lofty station on the Rocky Mountains, as 150, which is three times as great a number as have been observed before. In these localities, it is said, the atmosphere is steadier, and it is considered as owing to this fact that a star has been recognized at these high altitudes as having a companion or being a double star, not previously known as such.

An observer on the Pacific coast reports to Professor Pierce that he can see the companion of the star *Polaris* from a high point on the Sierra Nevada. It is well known that this is a test of great nicety, requiring the utmost purity of atmosphere. Telescopes will hereafter be placed higher than ever before—in Europe, probably on the Alps.

THE LOCOMOTION OF ANIMALS.

One of the most interesting papers read was prepared and delivered by Professor E. S. Morse, of Cambridge. The subject was the locomotion of animals, and the lecture, intended not merely for scientific consideration, was admirably adapted to popular comprehension by the graphic drawings made by the Professor on the black board during his discourse.

Microscopic animals were first treated. These move rapidly through the water by means of little oars or *ciliæ*. There are creatures which are destitute of shape and yet can form any part of themselves into stomach and digestive organs, or can temporarily assume forms which give them means of locomotion. Others throw out arms and seize their food, but yet have no specific shape when at rest.

Belonging to a higher order are the jelly fish. These strange creatures which, while in the water are perhaps as large as a wash tub, if dried scarcely weigh an ounce. They do not move by means of muscles, but by cells independent of each other, which, by contraction and expansion, answer the purpose of paddles.

The star fish is among the most curious of ocean forms, having his mouth in the center of his body, his eyes at the end of his arms, and a series of suckers, constituting locomotive appendages, thrown out from beneath the animal in the water. If the star fish wishes to travel, he attaches these suckers to whatever is ahead on the ocean bed before him and pulls himself forward. The common fresh water mussel has large muscles which give motion to a long foot which it wedges into the sand, and then, by contracting the foot, draws the shell after it. As they work along the shore, these fresh water mussels make grooves in the sand by which they can be tracked; in fact, wherever such a groove is, a mussel can usually be found at the end of it. There is another fresh water shell fish which darts out its foot with great rapidity and as suddenly contracts it, and by this propulsion swims through the water. The shell that pincushions are made of—the scollop—is that of an animal which swims by opening and closing its shells, forcing the water out from between them. The cuttle fish has two broad fins behind and a series of long arms in front. It draws in water as most shell fish do, but, unlike others, pumps it out in front so that it swims backward, though it has also, by other means, the power of swimming forward.

Worms move by means of little bristles which stick out from the sides of the body, and are used to hold part of the body while the rest expands, or while part expands the rest contracts, and thus the worm is drawn forward in sections. This is the case with the common angle worm. Among the crustaceans, the lobster either crawls forward with his legs or jumps backward by strokes with his tail. The eyes mounted on the end of long feelers can look over the shoulder of the animal while he is jumping backward.

In commenting upon lepidopterous and hymenopterous insects, the lecturer stated that, as with birds, if the wings are small, they move rapidly; if large, slowly. The grasshopper was referred to as having a variety of modes of locomotion; and the cheese mite or "skipper," it was stated, hopped by coiling his head and tail together in a ring and pulling them suddenly apart with a snap. After illustrating the movements of the fish and frog, those of the snake were explained. Its locomotion is obtained by means of scales, which are thrust against the ground by motions of the ribs, actuated by powerful muscles. It results that if a snake, though capable of the most rapid movement on the ground, be put on a smooth surface like that of glass or varnished wood, he will wriggle with great efforts, but make no forward progress.

The variety of functions performed by the muscles of the birds and the singular shapes of their bills, adapted to their various modes of feeding, were next illustrated. The arms are to become the organs of flight, and the bones are bridged, and trussed, and modified so as to give the requisite power. Below the heel and bones are extended and anchylosed so as to furnish the requisite prehensile strength. The tendons naturally close the toes when the weight of the body rests so as to bend the leg; thus the bird rests securely on its perch. Hence, also, the fowl always shuts its toes as it lifts them, because bending the leg draws the tendons. The modification of the arm in the bat still leaves it an organ of flight.

In the lower vertebrates we have simple fins; going up step by step the functions of the arm by degrees escape the need of use for locomotion. The higher the grade of animals, the greater the power of the arm for other purposes than that of locomotion. The monkey uses the arm and hand for a great variety of other purposes, such as for feeding itself, and the female monkey holds its young to its breast by means of its arms. At last with man the arm becomes a cephalic appendage, and is no longer used for purposes of locomotion, unless, indeed, he drives a hand car. Step by step among the lower animals we may trace the improvement of organ and of function until we reach its highest development in a species where only the lower limbs are employed to carry the body, and the upper become exclusively the servants of the brain.

TABLE OF VELOCITIES.

We publish in another column a list of one hundred and thirty velocities, interesting to engineers and mechanics, compiled by Dr. E. Hartig, Professor at the Royal Polytechnic School at Dresden, and translated for our journal by Dr. Adolph Ott. Information is given regarding the velocity of parts of almost every kind of machine, of mechanical tools, of water and air under varied circumstances, of vessels, of grain in elevators, of the flight of birds, of the transmission of sensation through the nerves, of railroad trains, of sound, of light, and finally of the electric current. The lowest velocity given is that of the burning of Beckford's fuse, which is consumed at the rate of ·39 inches per second; the highest is that of the discharging current of a Leyden jar in copper wire 1·7 millimeters in thickness, by which the inconceivable speed of 288,004$\frac{3}{10}$ miles is obtained in the same space of time. The table is worthy of careful perusal and preservation, as it contains many curious and interesting facts obtained by comparisons of the data given. Thus the highest velocity of the express trains on German railways (about 50·3 miles per hour) is greater than that of a strong wind. The velocity of the transmission of irritation in our sense

tory or motatory nerves is exceeded in rapidity by the flight of the swallow or eagle.

The compilation is of direct practical value, as it gives not only the highest admissible velocities, but also those that are the most advantageous in running a large number of the mechanical appliances in common use.

EXTENSION OF PATENTS. VALUE OF THE INVENTION.

To one who is conversant with the proceedings of the Patent Office upon application for the extension of patents, it is painful to observe how many of them fail, though they deserve success, because the requisite formalities have not been well understood and observed. While it is often obvious that the patent ought to be renewed, yet the privilege has to be denied, because the proper information has not been furnished to justify the Commissioner in granting it.

Before acting favorably in such cases, he ought to be satisfied, for instance, that the invention covered by the patent is of sufficient importance to warrant his action. It is a very common incident to find the device wholly frivolous, or so poorly adapted to practical use as to be of no value whatever. Yet the patent for it may stand in the way of others who are endeavoring to achieve some highly useful improvements, but cannot bring them to perfection without infringing the patent. It not unfrequently happens, also, that the patentee has received a greater or less sum from his invention, and the question will arise whether that is not as large a remuneration as his invention is entitled to. There are abundant reasons, in short, why the petitioner should make the value of the invention to appear. Accordingly the applicant for an extension is required in every instance to give a detailed statement of the value under his own oath, and to corroborate it by the evidence of disinterested witnesses. Something more is intended by this than a naked averment that the invention is worth a certain specified sum. The Commissioner should have the means of judging for himself what it is worth. The data should be furnished upon which he can decide for himself, and form an intelligent estimate of his own. Otherwise he might just as well take the petitioner's naked assurance that the invention is of sufficient value to entitle it to an extension.

The most satisfactory way in which this requirement is usually met is to show how many machines (if such is the invention) have been built and put in operation under the patent, and what is the net gain per day, or year, of running such a machine over those of the same kind which were known before. It can generally be made to appear that the products are so many more in number, or are worth so much more. If these statements are confirmed by disinterested witnesses, they constitute data from which a very fair calculation of the value of the invention can be made, and one that can usually be relied on.

When the invention is merely an improvement on some old instrument, a similar course can be pursued, and a comparison instituted between the instrument without the improvement, and the new one which embodies it.

It sometimes happens that, through poverty or injudicious sale of the invention, the patentee has been prevented from introducing it into use, as he might otherwise have done, and hence cannot furnish such a statement. He should explain this in making his application, and should satisfy the Commissioner by other means how much more valuable his machine is than others intended for the same purpose, and also whether it would go into use if he should obtain an extension of his patent. He may by these means furnish the Commissioner with good grounds for granting his petition.

These examples may serve to illustrate the measures necessary to be taken in order to establish the importance of the invention, to show that the patent deserves to be prolonged, and that the remuneration already received is less than the patentee is justly entitled to. The point to be kept in view is to furnish the Office with such information as will enable it to form an independent judgment upon the subject. The facts are what are wanted, not the opinions of others The affidavits of the most skillful experts that the invention is worth any particular sum, or is of great consequence, are of no use, because they undertake to substitute the estimates of other men in the place of those who have been designated by law to exercise their own facilities in forming the estimates to be acted upon. No one would think of asking a judge sitting in a court of law to rest his decision upon the views entertained by the ablest of his bar. Neither should the Commissioner, in determining whether a patent should be extended, be governed by the conclusions which any one else has formed, however competent he may be. His country holds the Commissioner responsible for what he decides, and relies on him for being guided by his own views.

A New Fuel for Locomotives.

The Russian Steamship and Railway Company announces that it has found the use of naphtha for steam generation, with locomotives, very advantageous. The material employed by the company is the crude oil from the Caucasian and Volga regions, and, compared by weight, the amount consumed was about one half that of coal. The arrangement for burning naphtha is stated to be of such a nature that no difficulty will be experienced in substituting one for coal consumption in place of it, should it be found desirable so to do.

Careful and repeated experiments made in this country during the past five years, in the burning of crude petroleum as a fuel for locomotives and ocean steamers, established the fact that the oil was a much dearer fuel than coal. Reports of these experiments will be found in the back volumes of the SCIENTIFIC AMERICAN.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.

1.—PRINTING ON METAL.—Can any one inform me if printing with ordinary type can be done on polished surfaces of either brass or iron, and how?—T. S. R.

2.—INJECTOR.—Will any of your readers tell me how to make an injector for the boiler of a one half horse power steam engine?—F. W.

3.—PARASITE OF THE BLACK CRICKET.—I recently crushed a common black cricket, about three fourths of an inch in length; and there came out of the body of the insect a brownish colored water snake more than 9 inches long, about one sixteenth of an inch at the largest diameter or center, and about one thirty-second of an inch at the smallest, or neck, with some appearance of a head. It has lived now 48 hours in water, and there is no diminution of vigor. It is very active. The cricket was very lively with its strange burden which was packed into the body between the soft parts and the external shell. Can you tell me what the phenomenon means? Did the cricket swallow the snake, or did the snake originate there?—H. E. C.

4.—SAW MILL QUERIES.—I am about erecting a saw mill on a small stream, under a 10 feet head; and I propose using a center vent wooden wheel of 5 feet diameter, with 14 inches depth of bucket. What number of inches of water under that head will it be necessary to use to drive a 5½ feet circular saw at the speed of from 900 to 1,000 revolutions per minute with a capacity of 6,000 feet of lumber in 12 hours? What number of revolutions would such a wheel make per minute when laboring under the full capacity? Is there any system of feed works whereby feed can be regulated while the saw is running? I do not like the system of cone pulleys or the sliding belt cone feed. I wish to arrange so that I can change the cut of the saw to light or heavy feed, without shifting belts. If there is any such device, I would like to have a description of it.—P. P. S.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

MAKING WOOD AIRTIGHT.—O. S. C.'s query is too vague. Does he mean stopping the cracks in wooden buildings, or closing the pores of porous timber?

B. F. C.—The mineral you send is iron pyrites—sulphur and iron; it is of no special value.

W. M., of Minn.—We do not recommend the use of any patent eye cups for improving the sight. If we ever advocated their use, it must have been many years ago, when we were young and inexperienced.

THE TRANSPARENT LIQUID OF THE ORGANS OF VISION.—J. De W. C.'s suggestion can easily be tried by himself or the nearest photographer. How does he propose to make the liquid deposit a film?

RUST INDUCED BY SODA AND CHLORIDE OF LIME.—S. A. T., of Pa., should be careful not to leave any salts exposed to the air near bright steel goods. Chloride of lime will absorb moisture till all the chlorine is set free, and will then yield it again to the atmosphere.

REMOVING IRON RUST.—To R., query 1, page 122.—Put one half teaspoonful oxalic acid to one half teacup of water, and apply it to iron rust, fruit and other stains. Exposure to the sun will remove them. —Mrs. P., of Tenn. [Yes, and the acid will destroy the fabric unless washed off soon after its application.—EDS.

CHLOROFORM.—C. T. B., query 1, page 170, is informed that chloroform consists of three atoms of chlorine and one atom of formyl, which latter is a bicarburet of hydrogen. It may be thus called terchloride of formyl, and it has the formula

$$C_2HCl_3.$$

Its manufacture is always a complicated process, one of the simplest forms being as follows: Put three pounds chlorinated lime into two gallons alcohol of sp. gr. ·844; distil a gallon from this mixture, and rectify by redistillation, first from a great excess of chlorinated lime and afterwards from carbonate of potassa.—D. B., of N. Y.

THE JAWSHARP.—B. query 15, page 170, may be assured that the various tones of the jawsharp are caused by the different pressures of the breath on the tongue of the harp, which tongue is kept in motion by the touch of a finger. The vibration of the vocal organ would not affect it, unless the player sang on to the instrument.—D. B., of N. Y.

MILK AND INK STAINS.—P., query 3, page 170, is informed that the milk, being left to dry in the fabric, develops lactic acid, which is the only matter in milk that could affect an ink stain. I do not think an ink blot that had been dry for a few weeks could be affected by this acid.—D. B., of N. Y.

KOUMISS.—Query 4, page 170.—W. R. J. will find some difficulty in preparing koumiss unless he has access to a horse breeding farm. The genuine koumiss of Tartary is distilled from mare's milk while undergoing fermentation, and the milk will yield the large proportion of 14 ounces of an alcoholic fluid for every 21 ounces milk. This fluid contains about 6 ounces alcohol. Cow's milk contains less saccharine matter, and consequently yields less alcohol in distillation.—D. B., of N. Y.

RUST JOINTS.—Query 9, page 170.—Has D. M. tried the effect of heat, applied externally, so as to expand the socket?—D. B., of N. Y.

SPONTANEOUS IGNITION.—To G. T. R., query 9, page 122.—Mix a tablespoonful of chlorate of potassium with about the same amount of brown sugar. If a few drops of ordinary sulphuric acid be poured on this mixture, it will ignite and burn with a beautiful violet colored flame, giving sufficient light for your purpose.—P. T. B., of N. Y.

SOLDERING LEAD.—To J. C. H., query 4, page 138.—Plumbers' solder is an alloy of 1 part lead and ½ part tin; apply with an ordinary soldering iron, the joint having been first scraped clean and rubbed with tallow or rosin.—C. O. L., of Pa.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

DREDGING MACHINE.—Hyacinthe Gonellaz, of Houma, La.—This invention relates to a new dredging machine, to be used in rivers, canals, or lakes; and consists in a novel arrangement of colters and buckets with swinging backs or dumping spoons, receiving pans, and operating mechanism. Whenever a filled bucket arrives in front of the receiving pan, the latter is swung toward the same into position to receive the contents discharged therefrom. The pan is then carried back and dumps its contents into a second distributing pan, receiving reservoir, or tank. Whenever a bucket arrives in front of the pan, in position for discharging its contents, the spoon in such bucket is vibrated by gravity and by its connection, or either, to insure a complete discharge.

INK FOUNTAIN FOR PRINTING PRESS.—Henry B. Allen, Brooklyn, N. Y.—This invention has for its object to facilitate the adjustment of the bottom of an ink fountain during operation of the press with which the same is connected. Ink fountains having adjustable bottoms were heretofore provided with screws beneath the bottoms for regulating the same and thereby controlling the efflux of ink. It was difficult to reach the screws under the fountain, and occasioned at times injury to the hands of the attendants, which were jammed between the fountain and the ink disk. This invention consists in applying the screw by which the bottom of the fountain is adjusted above the bottom through a bridge that extends across the top of the fountain. The screw or the nut thereon is thereby exposed and in convenient position for adjustment.

CARRIAGE RUNNING GEAR.—William Hemme, Michigan Valley, Kan.—This invention refers to an improved running gear in which the two axles are connected with each other, not by a perch, as usually, but by a rod, which is jointed at both ends. This rod keeps the axles in the middle a certain distance apart, and at the same time permits their being easily turned in a horizontal direction. By an improved connection at the hounds the hind axle will, whenever the front axle is turned, be swung in the opposite direction, carrying the hind wheels into the track in which the front wheels are running. The turning of the vehicle and its management are thereby materially facilitated. The claims allowed cover the combination with the axles of the rod jointed at each end to one of said axles, the slotted rear hound, and the overlapping front hound having a pivot on the end.

GLOVE.—Solomon J. Clute and Daniel M. Durfee, Rockwood, N. Y.—The gloves upon which this claims to be an improvement are mainly formed of a plain piece and two fourchettes, the former being cut so as to lap and constitute the back of the first and fourth fingers, and the latter to form the back of the second and third fingers. By the new method of cutting out gloves the palm piece is made of such form and size, and so much of the glove is taken up by the three fourchettes, that a skin which is defective may be utilized, without any increased cost in sewing or making up the glove, labor being always a small item of expense as compared with the stock or material used, thus saving a great amount of stock.

COUGH LOZENGE.—Edmond Gauvreau, Quebec, Canada.—This invention or discovery relates to a new and useful compound, in the form of lozenges, for the cure of coughs, colds, and affections of the throat and lungs, and all diseases of the respiratory organs. The inventor takes two parts of pulverized Ipecacuanha and opium, sixty-four parts sugar, one part citric acid (solution), two parts alcohol, one part sirup of pine apple; tragacanth sufficient for coloring. These ingredients are mixed together to form a solid mass of paste, which is then cut into lozenges, and put up in boxes for use.

PERAMBULATOR.—Thomas Galt, Rock Island, Ill.—This invention relates to a new perambulator whose handle is connected with the front axle, to steer by means of the front wheels, and it chiefly consists in a new manner of connecting the handle with the axle; also, in a reversible feature which allows the handle to be applied to the front of the vehicle to convert it into a four wheeled carriage that is drawn forward instead of pushed; and, further in the use of stops on the under side of the carriage for arresting the perambulator handle during the side motion, and preventing it from becoming disconnected from the axle.

MOTIVE POWER FOR OPERATING SEWING MACHINES.—Henry Warren and Charles H. Luther, Providence, R. I.—This invention consists of a novel and efficient arrangement of a spring winding, holding, regulating, and transmitting apparatus. A crank shaft has a drum inclosing a spring fixed loosely on it, said spring being connected at its outer end to said drum, and at the inner end to a hub made fast to the shaft. The face of this drum gears with a small roller, by frictional contact, to transmit the motion through a shaft and pulley. A disk at one side of the drum, attached to brackets, projects from one side of the frame, and has a ratchet toothed hub, on the outside, for holding the shaft after the spring has been wound up by a pawl, pivoted on an arm of said shaft. There is a friction holding disk on one side of the drum, opposite to the one where the ratchet is arranged. Its hub is pivoted in the ends of a crotched shifting lever pivoted on the bracket. This disk, being pressed against the side of the drum, will stop the machine or slow the motion, as required. It also holds the disk while winding up the spring, which is done by turning a hand crank. This arrangement affords a simple and efficient apparatus, which may be wound up by a few turns of the crank, and will run a sewing machine or other light machinery very much longer than the time required to wind it up.

FLOUR PACKER.—Charles E. Zimmerman, Frederick, Md.—This invention is an improvement in flour packers of the class in which an ascending and descending platform for carrying the barrel is operated by a counterpoise weight and graduated conical roller, said platform acting in connection with a fixed curb that enters the barrel, and within which the packing devices proper are rotated. The invention consists of a drop plug for cutting off the flour, and contrivances, to be set free by the descending platform, for dropping the plug at the proper time; and it also consists of a register arranged in connection with the apparatus, and having a weighted lever for actuating the pawl so arranged as to be tripped by the platform when it goes down, so as to register each time.

RAIN WATER CUT OFF.—John Abercrombie and Elijah D. Miner, of Morrisania, N. Y.—This invention consists of a spout pivoted to a leader pipe at a hole in the side of said pipe in such manner that it will swing up against the pipe, close the hole, and constitute a part of the side of the pipe when it is desired to have the water run straight down through the pipe to the cistern below; and when it is desired to shut the water off from the cistern and spout it out upon the ground or into a trough or the like the said spout will swing down to a standing position, close the passage down the pipe, and open the one through the side. The inner end at this time closes up against a curved deflecting plate fitted on the inside of the leader pipe in such manner as to fit snugly into the upper side of the spout and make a tight joint between the said inner end of the spout and the side of the leader pipe.

PISTON ROD PACKING.—James Melledge Flagg, of Providence, R. I.—The object of this invention is to furnish an article for packing the piston rods and valve rods of steam engines that can be easily applied, and that will stand heat and pressure without being injured. The inventor takes a cord of rubber, prepared by a process of his own. Over this cord he braids a covering of cotton yarn, then soaks the cord so arranged in a solution of alum, and then applies, with a brush or in some other manner, a mixture composed of: argillaceous mineral, silica, water; a trace of magnesium, iron, and lime, ground asbestos, powdered plumbago, alum, and common hard soap are added. After two or three coats of the mixture have been applied and while yet in a moist state, a coating of undressed hemp, twine or similar material is braided over it. Other coats of the mixture are applied until the packing is of the desired diameter; it is then finished with a braiding of cotton yarn. The packing after being soaked in a solution of the argillaceous mineral and alum is wound spirally around an arbor and by means of a screw forced into a mold or tube of the desired size. Finally the vulcanizing process, before referred to, is applied, and when the packing is removed from the mold it retains the spiral shape, so that it can be applied to piston or valve rods by what is known as "cork screwing" and pushed "home" into the gland, which it is designed to exactly fit.

VARNISH PACKAGE.—William C. Kennedy, New York city, and Peter T. Kennedy, Bradford, Pa.—This invention relates to an improved keg for holding and transporting varnish, and the improvement consists in giving an arched form to the metal head, to which the lifting handle or bail is applied, and in fitting its circular edge in a V shaped croze. The combination of a concavo convex metal head, with a wooden body or keg, provided with a V shaped croze, for the purpose specified, is the claim allowed in the letters patent.

CORN PLANTER.—Robert M. Bowman and William H. Bowman, London, O.—This invention has for its object to furnish an improved seed dropper for corn planters so constructed that it cannot clog or choke with chaff, at the same time simple in construction and easily worked. By the construction, it is claimed, the chaff can pass out freely, and cannot clog or impede the slide, which at the same time has no flanges or grooves for the chaff to get into and thus clog it.

CHURN.—Henry C. Bell, Edina, Mo.—This invention has for its object to furnish an improved attachment to ordinary churns, so constructed and arranged as to bring the butter quickly and with little expenditure of labor: and it consists in the construction and combination of the body of the churn, a cover, and a dasher handle, made hollow and closed at its lower end by a hard wood plug. To the side of the lower part of the tubular handle is attached the end of a curved pipe, which communicates with the interior of the said tubular handle through a hole in its side. To the rear or free end of the pipe is a hood made hopper shaped, attached to the end of the pipe by one or more cross bars, and with its smaller end toward the end of the pipe. When the tubular handle is revolved, the rear end of the pipe and the hood are carried rapidly through the milk, the form of the hood increasing the force of the current past the end of the pipe, causing a vacuum, and thus drawing the air through the handle and pipe and discharging it into the milk, and causing, in connection with the currents formed by the movement of the pipe and hood, a violent agitation in the milk. Detachable current breakers, in combination with the tubular handle, curved pipe hood, and churn body are other novel features in the invention.

SECTIONAL BOAT.—William H. Philip, Brooklyn, N. Y.—This invention consists in the construction of small row or sail boats in short transverse sections, for extending and shortening in the lengthwise direction in the manner of a telescope, the said sections being so tapered that in extending them to adjust the boat for use the inner ones bind in the outer ones, similarly to telescopic drinking cups, so as to make water tight joints. Besides so binding together, they may also be fastened by bolts to be taken out when the boat is to be shortened up. The object is to provide boats for sportsmen, travellers, army purposes, and the like, that can be readily shortened up into a compact package for economizing space in storage or transportation.

FILTER FOR CANE JUICE AND OTHER LIQUIDS.—Enos Tuttle, Jeanerette, La.—This invention consists of a reel similar to the reels of flour bolts, with a cover of flannel, wire or hair gauze, or other suitable filtering substance, arranged in a suitable case provided with a vat at the head, with a grate in it, into which the juice flows to retain the coarse matters—such as leaves, pieces of stalk, etc.,—where they can be removed from time to time by hand; thence the juice flows into the reel and percolates through the gauze to a vat below, while other foreign matters are discharged at the end of the reel.

BARREL MACHINERY.—M. T. Kennedy, New Brighton, Pa.—This invention relates to machinery for the manufacture of cooper work—barrels, kegs, etc.; and consists in a machine for squaring the end of the barrel or keg and cutting it to a given length, beveling the chime and cutting the croze. The operation of the machine commences after the staves of the keg or barrel have been put together and secured by truss hoops, which hoops are afterward removed and replaced by ordinary hoops. The barrel or keg trussed in this manner is placed in a revolving hollow cylinder, and adjusted centrally therewith and fastened, and the cylinder is revolved by means of a belt, and the machine levers for squaring, beveling and crozing are then applied.

CANAL BOAT.—Lewis Howard and Chas. Howard, Watkins, N. Y.—The invention consists in a bearing block (for propeller shafts) that slide up and down and is adjusted at any point in rigid perpendicular guides; whereby all motion of the shaft out of its proper axial line is prevented. The adjustable bearings that are pendent have been found to vibrate and cause the propeller shaft to lack that uniformity in its line of motion which is desirable to enable the propeller properly to perform its function. The invention also consists in a brass guard that swings under and slightly in advance of the propeller, to depress and remove from the wheel the growth of grass that springs up on the bottom of canals. The invention also consists in an adjustable bearing plate (on the inside of the boat) which will enable the propeller shaft to work as nearly as possible in a horizontal plane.

ORE SEPARATOR.—David Gross, Maxatawny, Pa.—The object of this invention is to furnish an improved machine for cleaning ores of sand, more especially designed for iron ores, but not confined exclusively thereto; and it consists in an upper coarse sieve and in a lower fine sieve arranged parallel or nearly so in an inclined position, and suspended by links and pivoted at opposite ends, respectively, and connected with a double crank shaft by rods in such a manner as to be simultaneously vibrated in opposite directions. The advantage of having the screens vibrate in contrary directions is to largely relieve the frame work and operating mechanism of the jar and consequent wear and tear which obtains in machines in which the sieves vibrate simultaneously in the same direction.

FIRE PLACE.—Michael Haughey, St. Louis, Mo.—This invention has for its object to furnish an improved means for utilizing the heat wasted in heating a room with a grate, and which usually passes off through the chimney, so as to heat the room quicker and more thoroughly, and at the same time economize fuel; and it consists of an air chamber arranged in the back of the fire place from which the air heated by the fire rises to another enclosed space situated above the grate, thence passes to a spiral chamber winding around the flue, from the upper part of which it enters the room to be warmed through a register. Openings are also made in the side and back of the first mentioned air chamber, that in the former communicating with the apartment while the other leads into another room or into the open air. A trough of water designed to moisten the air and absorb the carbonic acid gas drawn from the atmosphere in the room is placed in the spiral chamber.

STEAM ENGINE GOVERNOR.—William C. Freeman, Louisiana, Mo.—This invention relates to a new steam engine governor in which the rotation of an eccentric within a chamber filled with a liquid, and having spring valves that bear against the eccentric, causes a movement of the surrounding vessel and a consequent adjustment of the steam valve.

POWDER PACKING APPARATUS.—Kendall F. Knowles, New York city.—This invention relates to a new apparatus for and method of filling, at one time, a large number of small bottles, boxes, or other vessels with insect powder or other powder, making the separate handling and filling of each bottle, box, or vessel unnecessary. The invention consists in the combination of a movable sieve, with a conveying hopper and with a receiving box, into which the powder is discharged, and which can be vibrated to even the powder contained in it. By this means a gross or several hundred of bottles or small vessels may be filled in a few minutes, where heretofore it took hours to fill the several bottles or small vessels singly.

BALE TIE.—Joseph L. Haigh, New York city.—This invention has for its object to furnish a simple, convenient, and reliable wire band for baling hay, straw, cotton, and other substances put up in bales. A wire band, upon one end of which is formed an eye by turning the end of the wire back upon itself, and twisting said end and the body of the wire together, has its other end doubled back upon itself to form a hook, and the said end from the base of the hook and the body of the wire are twisted together. The two plies of the wire at the base of the hook are spread apart, to form another eye of sufficient size to allow the first mentioned eye to pass through it. In using the band it is passed around the bale; the first eye is then passed through the second eye and over the hook. By this means the strain or spring of the bale upon the band will tend to draw the hook down toward the bale, so that, however great the strain may be, the hook cannot be straightened out, as it is liable to be when the first or only eye is hooked upon the hook in the ordinary manner.

CALCULATING MACHINE.—William Robjohn, New York city.—This invention is by one of New York's oldest and most distinguished inventors. It relates to a new adding machine, which is operated by means of numbered keys, and so arranged that mistakes cannot occur as long as the mechanism is in working order, as all keys are locked as long as any one is more or less depressed, and as the key depressed cannot be restored to its elevated position unless it has first been entirely pushed down. Errors that might arise from depressing some of the keys partly, and thus adding only fractions of the numbers which such keys represent, are thus entirely obviated, and rapid action, insuring absolute accuracy, can be performed. The invention consists, first, in combining with the shank of each key a toothed portion, which holds the key as long as it is only partly lowered; also in the use of a cam which serves to throw the toothed portion of the shank of the key out of contact with the catch as soon as the key has been entirely depressed, and thereby enables the key to ascend after having completed its stroke, though not before: also in the arrangement, under the several keys, of a pivoted L-shaped plate, which is turned under the non-depressed keys by the one descending, and prevents such other keys from being depressed until the descending key has again been elevated to its neutral position, when the L plate is swung out of the way of the other keys. Action on any key is thus automatically prevented until all keys are raised, while, as before stated, none can be raised until its downward stroke has first been completed.

BORING MACHINE.—Edward C. Cole, Pawling, N. Y.—This invention has for its object to furnish an improved machine for boring the hubs of carriage wheels which shall be simple, convenient, and effective, being so constructed as to bore the hub perfectly true with the rim, and to allow the wheel to be put on and taken off without removing any part of the machine except the rod.

WAGON SHEET AND TENT.—Milam M. Fitzgerald, Gonzales, Texas.—The invention consists in providing the ordinary wagon sheet or cover at the sides with pieces of canvas or other fabric, which can be let down and staked to the ground to form a tent around the wagon, and which, during daytime, or while the concern is in motion, can be rolled up and secured at the sides of the cover to be entirely out of the way. The tent sides are provided with lapels which form the ends of the tent when let down. No poles, rods, or bars of any kind need be carried, and the tent can be pitched in a very short time, and also rolled up quickly. It is a capital contrivance for emigrant wagons.

CAT HOOK AND STOPPER.—David H. Cousins, Surry, Maine, assignor to himself and James H. Knowles, of same place.—The object of this invention is to provide means for supporting anchors upon the side of a vessel, out of water, so as to leave the cable or chain free; and it consists in a cat stopper attached to the vessel, so constructed that it will take hold of the chain or anchor and support the anchor out of the water, and so that it may be made to "let go" and free the anchor instantly. This cat stopper consists of two main bars pivoted together. One bar has a mortise and loop at its end, by means of which loop the nipper is attached to the vessel. The other bar has a projecting hook or horn, which is made to engage with a link in the chain near the anchor, so as to support the anchor out of water, while leaving the chain free to be overhauled on the deck of the vessel. The second bar is held in position by means of a hook plate pivoted to the end of the bar and passed through the mortise, and it hooks onto the opposite side of the first bar. The plate is secured in this position by a key. When it is desired to let the anchor "go," the key is knocked out and the plate is raised in the mortise so as to unhook it, which releases the second bar, when the anchor drops. By this arrangement the chain is released, and may be overhauled at any time, and the anchor may be dropped without delay.

STALK CUTTER.—Robert F. M. Flack, Columbus City, Iowa.—This invention is an improvement in rotary stalk cutters, and consists in the manner of arranging the frame, cutter wheel, and hoisting device, so that when the wheel is out of action the frame in which the same is mounted may be elevated, whereby the hoisting rope may be relieved of strain and certain other advantageous results secured. Among other advantages claimed for the improvement the inventor states that the cutters are double edged, and they are fitted in slots in the ends of the arms and secured by bolts in such manner that they may be taken off and reversed readily when one edge has become dull.

MACHINE GUN.—William A. Miles, Salisbury, Conn.—This invention relates to a battery gun, which is provided with sliding barrels. The entire mechanism is rendered simple by the use of the sliding barrels, and all the intricate devices usually applied to battery guns dispensed with. The invention consists in the arrangement of reciprocating barrels, arranged side by side, and connected with rotary cams or levers, whereby they are successively or jointly moved back and forward. During their backward motion they close over the cartridges that have dropped behind them upon sliding supports. When quite moved back their motion is arrested and the cartridges are exploded. The barrels are next moved forward to allow the empty cartridge shells to drop down behind them. The invention also consists in the new loading mechanism, which is composed of reciprocating carriers that convey the cartridges from a receiver to the upper sides of the barrels, from which said cartridges are finally dropped upon the sliding supports. The firing mechanism is also quite novel, and the whole gun taken together exhibits very great ingenuity on the part of the inventor.

PIANO STOOL.—Charles A. Schindler, West Hoboken, N. J.—This invention has for its object to furnish an improved back for piano stools, simple strong, durable, inexpensive, and ornamental. The seat of the stool is attached to a pedestal or feet, and upholstered in the ordinary manner. To the rear part of the seat of the stool are attached the lower ends of two iron rods. The lower ends of these rods are bent forward to cross the top flange of the seat frame and then bent downward across the inner edge of said rim, and are secured firmly in place by screws. The rods are bent into some graceful shape, and to their upper ends is attached a back rest, the forward side of the said back rest being upholstered in the same manner as the seat. In the space between the seat, rods, and back rest is placed an ornamental device or center piece which may be made in the form of a harp, and which is secured to the seat frame and back rest. The iron rods are designed to give strength to the back, and enable it to have the requisite strength, and at the same time to be made sufficiently light to avoid all appearance of clumsiness.

LARD AND BUTTER CUTTER.—William M. Bleakley, Verplanck, N. Y.—This invention relates to a new self cleaning stick for transferring lard, butter, tallow, tar, or other viscid or semi-liquid substance from one vessel to another. The invention consists in providing such stick with a slide, whereby it can be cleared without soiling the fingers of the person handling it. The shape and size of the stick can be varied at pleasure.

RAILWAY CAR SEAT AND COUCH.—This invention consists in a new mode of combining the seat back with sliding frames, and in the use of auxiliary backs to utilize as fully as possible the space within the car. Proper head-rests may be removably applied to the ends of the couches. The outer part of the seat may be supported on a circular metallic track sunk into the floor of the car, and arranged with sockets or catches, or both, to lock the seat in any desired position.

BRICK KILN.—Francis Strayer, Clinton, Iowa.—The object of this invention is to economize fuel and lessen the amount of labor required in burning brick; and it consists in the arrangement of a kiln, constructed of masonry, of square, rectangular, or other form, and of any required size, in filling which a succession of arched apertures in which the coal or fuel is placed for burning the brick is formed. These apertures or pockets are distributed throughout the mass of brick, being made as the brick are packed in filling the kiln. The coal is introduced as the arches are made, or through the sides of the kiln, as may be most convenient. There are apertures through the sides of the kiln, for observing the condition during the process of burning. These apertures are closed with plugs which can be removed as required. To supply the requisite amount of oxygen for the consumption of the fuel, one or more bellows are employed. The blast of each bellows may be used separately and on opposite sides of the kiln, alternately, or the bellows may be used alternately. A fan blower or blowing cylinder may be used, as may be found advisable. The bricks are placed loosely in the kiln, so that the heat can circulate freely through it as in ordinary brick kilns.

CHILL PLATE AND FLASK.—Dennis Long and Samuel A. Miller, Louisville, Ky.—The invention consists in a flask having a flange provided with lugs, combined with a chill plate having a flange provided with notches, whereby the flask and chill plate are centered and held in a fixed relation to each other with great convenience and facility.

WALKING SEED PLANTER.—Luther C. Ives, Land of Promise, Va.—This invention relates to an improvement in walking seed planters, and consists chiefly in the method of imparting a continuous rotary motion to a seed distributing disk, through the medium of a combined transporting and covering wheel and a system of double crank shafts and connecting rods.

PAD CRIMP AND LAST FOR HARNESS.—Richard B. Calvert and William Michael, Mansfield, Ind.—This invention relates to a new device for stretching the leather for all kinds of harness pads, and also to a new sectional last for keeping the pads distended while being stitched in the stitching horse. It consists, also, in making the last, for holding the pad distended, of a series of blocks, which are made in sections, obliquely divided, to prevent displacement, but permit their ready removal from the stitched pad.

CIDER BITTERS.—Thomas P. Devor, Millerstown, Pa.—This invention has for its object to furnish improved cider bitters, to contain lactic acid but no acetic acid, producing a good drink for warm climates and seasons, and which shall be beneficial in bilious complaints and in many forms of dyspepsia; and it consists in preparing cider from apples, allowing it to ferment, after which apple twigs are boiled in a portion of this cider in the proportions of one pound of apple twigs to one gallon of cider. In this decoction, when cool, are dissolved the whites of eggs, in the proportion of six eggs to one quart of the decoction. One quart of this solution is poured into each barrel. Refined white sugar, birch bark, and wild cucumber (magnolia glauca) pods or bark are also put into each barrel in certain proportions.

MACHINES FOR DOWELING FELLIES.—Joseph P. O'Brien, Kewanee, Ill.—The old mode of doweling fellies was to bore a hole in the end of each of the sections of the felly which were to form the joint and insert the dowel pin into one of the holes and then drive the two sections together. The latter and improved mode is to butt the two ends of the sections together and then make one or more slots or kerfs with a circular saw across the joint, and introduce a thin piece of metal into such slot, which the tire of the wheel holds in place. This machine is designed for the latter mode of doweling, and consists in a clamping device with one or more saws connected therewith for sawing the dowel plate slots, and a feeding lever in combination with the saw arbor.

FLOWER POT.—Matthias Ludlum, Middlebury, Vt.—This invention has for its object to improve the construction of a flower pot patented March 1, 1870, to the same inventor, so as to make it more convenient and satisfactory in use, and to adapt it to be removed from plants too bushy or brittle or twining to pass through it; and it consists in the combination of a saucer with a bottomless body, made in sections, which is intended to allow the body of the flower pot to be opened up and removed from the soil and roots of the plants when said plants are too large, bushy, or tender to pass through the pot, or when they are long or twining vines, so that they may be repotted or set in the ground without injuring them or even checking their growth.

SOD CARRIER.—Charles D. Meigs and Montgomery C. Meigs, Romney, Ind.—This invention has for its object to furnish an improved sod carrier, designed especially for use in carrying off the stiff prairie sod turned over by the plow in opening ditches, grading roads, etc. It is simple, convenient, and effective, enabling more work to be done in less time and with less labor for man and team than when the ordinary means are employed.

SKIRT ELEVATOR.—M. H. Bergen, Brooklyn, N. Y.—The inventor states that it is a necessity for a skirt elevator, to be attached to every dress for the convenience of a lady in case she should be overtaken in a storm, or when the streets are damp and muddy. She offers to the public an elevator in the use of which a trained dress can be converted, with one minute's adjustment, into a walking costume which cannot be recognized as a long dress. This gives the advantage of using the same dress either for an evening, toilet, or a walking dress. The invention consists of a tape with rings attached and a cord passing through them, and fastened with a ring to the waistband in the center of the back.

CHURN.—Nicholas Hospers, Pella, Iowa.—This invention relates to a machine which may be applied to the operation of any ordinary dasher churn. The churn is placed on a platform from which arises an upright frame. To the dasher handle is attached a guide rod which passes through holes in the upper part of the frame. A socket in the lower portion of the guide rod, to which is pivoted a forked connecting rod which communicates with a pin block detachably secured to a crank arm, connects the latter and the churn dasher, and gives to the dasher a combined reciprocating and rotary motion.

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How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

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Preliminary Examination.

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To Make an Application for a Patent.

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6,031.—CARPET.—J. M. Christie, Brooklyn, N. Y.
6,032.—PUMP BARREL.—J. W. Douglas, Middletown, Conn.
6,033 to 6,037.—CARPETS.—J. Fisher, Enfield, Conn.
6,038 to 6,051.—CARPETS.—O. Heinigke, New York city.
6,052 to 6,057.—CARPETS.—H. Horan, Newark, N. J.
6,058.—CARPET.—C. S. Lilley, Lowell, Mass.
6,059.—CARPET.—D. McNair, Lowell, Mass.
6,060 to 6,063.—OIL CLOTH.—C. T. and V. E. Meyer, Lyon's Farms, N. J.
6,064 to 6,070.—CARPETS.—J. H. Smith, Enfield, Conn.
6,071.—MEDAL.—S. Van Campen, New York city.
6,072.—CARPET.—J. M. Christie, Brooklyn, N. Y.
6,073.—RUSTIC CROSS, ETC.—A. De E. Bloodgood, New York city.
6,074 and 6,075.—PRINTING TYPE.—H. Ilenburg, New York city.
6,076 to 6,089.—SHAWLS.—F. Wink, Philadelphia, Pa.

TRADE MARKS REGISTERED.

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967.—CARRIAGE BOLT.—Plumb & Burdict, Buffalo, N. Y.
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

22,133.—BUSTLE.—G. V. and E. A. Pierce. Nov. 6, 1872.
22,152.—KETTLE FOR TRYING OIL.—J. L. Alberger. Nov. 13, 1872.
22,165.—PUMP.—A. Cooley. Nov. 13, 1872.
22,174.—PREVENTING INJURY TO WATCH SPRINGS.—D. B. Fitts. Nov. 13, 1872.
22,216.—HAY AND COTTON PRESS.—H. Barnes. Nov. 13, 1872.
22,668.—COLORING AND CURING TOBACCO STEMS.—B. Payne. Jan. 2, 1873.

EXTENSIONS GRANTED.

15,693.—HORSE POWER.—A. W. Gray.
21,290.—LATHE FOR BEADED WORK.—F. Baldwin.
21,268.—HORSE RAKE.—M. Morgan.
21,272.—METALLIC BALE TIE.—I. C. Plant.
21,275.—ICE STAND.—H. A. Roberts.
21,286.—TEMPERING WIRE.—H. Waterman.

DISCLAIMER.

21,268.—HORSE RAKE.—M. Morgan. Filed August 29, 1872.

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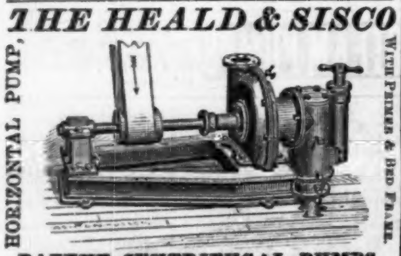

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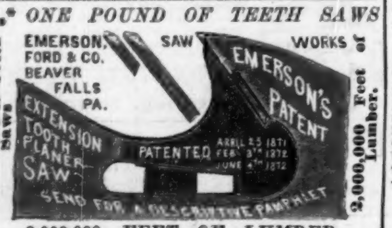

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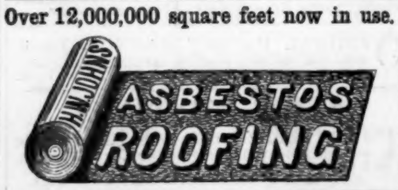

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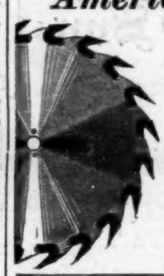

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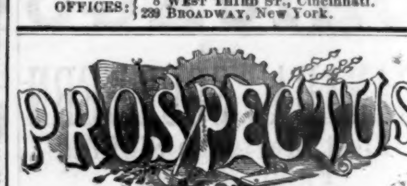

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